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TRANSACTIONS

OF THE

AMERICAN CLIMATOLOGICAL ASSOCIATION.

FOR THE YEAR 1912.

VOLUME XXVIII.

"The object of this Association shall be the study of Climatology and Hydrology and of Diseases of the Respiratory and Circulatory Organs."—*Constitution.*

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PHILADELPHIA:

PRINTED FOR THE ASSOCIATION.

1912.

NOTICE.

The Association assumes no responsibility for the statements and opinions expressed in the papers read at its meetings.

OFFICERS OF THE ASSOCIATION.

PRESIDENT.

ALEXANDER D. BLACKADER, M.D., MONTREAL, 1912.

VICE-PRESIDENTS.

H. M. KING, M.D., LOOMIS, N.Y., 1912.
C. E. EDSON, M.D., DENVER, 1912.

SECRETARY AND TREASURER.

GUY HINSDALE, M.D., HOT SPRINGS, VA.

REPRESENTATIVES ON THE EXECUTIVE COMMITTEE OF THE CONGRESS.

DR. ROLAND G. CURTIN, PHILADELPHIA,
DR. THOMAS DARLINGTON, NEW YORK, *Alternate.*

MEMBER OF COMMITTEE OF ARRANGEMENTS, 1912.

DR. THOMAS A. CLAYTOR, WASHINGTON, D.C.

COUNCIL.

THOMAS D. COLEMAN, M.D., AUGUSTA, GA.
CHARLES E. QUIMBY, M.D., NEW YORK.
EDWARD R. BALDWIN, M.D., SARANAC LAKE, N.Y.
JOHN W. BRANNAN, NEW YORK.
JUDSON DALAND, PHILADELPHIA.

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LIST OF OFFICERS.

Presidents.

NAME	YEAR
A. L. Loomis	1884–5
William Pepper	1886
Frank Donaldson	1887
A. L. Loomis	1888
V. Y. Bowditch	1889
Charles Denison	1890
F. I. Knight	1891
W. E. Ford	1892
R. G. Curtin	1893
A. H. Smith	1894
S. E. Solly	1895
J. B. Walker	1896
E. Fletcher Ingals	1897
E. O. Otis	1898
Beverley Robinson	1899
Abraham Jacobi	1900
Robert H. Babcock	1901
Samuel A. Fisk	1902
Norman Bridge	1903
James C. Wilson	1904
W. F. R. Phillips	1905
E. L. Shurly	1906
Thomas Darlington	1907
Thomas D. Coleman	1908
Charles E. Quimby	1909
Edward R. Baldwin	1910
John Winters Brannan	1911
Alexander D. Blackader	1912
Charles L. Minor	1913

Vice-Presidents.

NAME	YEAR
F. I. Knight, W. H. Geddings	1884–5
Frank Donaldson, Beverley Robinson	1886
V. Y. Bowditch, R. G. Curtin	1887
A. Y. P. Garnett, J. T. Whittaker	1888
J. R. Leaming, E. T. Bruen	1889
A. L. Gihon, H. B. Baker	1890
E. L. Trudeau, T. S. Hopkins	1891
E. Fletcher Ingals, Beverley Robinson	1892
A. H. Smith, E. O. Otis	1893
I. Hull Platt, E. L. Trudeau	1894
John H. Musser, G. R. Butler	1895
Charles E. Quimby, James A. Hart	1896
S. A. Fisk, John C. Munro	1897
Beverley Robinson, C. F. McGahan	1898
James A. Hart, R. C. Newton	1899
R. H. Babcock, J. W. Brannan	1900
Albert C. Peale, S. W. Langmaid	1901
Norman Bridge, W. F. R. Phillips	1902
James C. Wilson, H. S. Orme	1903
Thomas Darlington, Thomas D. Coleman	1904
S. G. Bonney, S. D. Risley	1905
A. D. Blackader, Henry Sewall	1906
Frank Fremont-Smith, C. L. Minor	1907
Judson Daland, Charles Fox Gardiner	1908
E. R. Baldwin, C. E. Edson	1909
James M. Anders, H. Longstreet Taylor	1910
Will Howard Swan, John H. Lowman	1911
Herbert Maxon King, Carroll E. Edson	1912
James M. Anders, C. D. Alton	1913

Secretaries and Treasurers.

James B. Walker	1884–95
Guy Hinsdale	1895

LIST OF MEMBERS.

Honorary Members.

ELECTED

1888. Abbot, Griffith E., Leominster, Mass.
1887. Fisk, Samuel A., Brimfield, Mass.
1902. McBride, James H., Pasadena, Cal.
O. M. Orme, H. S., 214, Douglas Building, Los Angeles, Cal.
O. M. Reed, Boardman, Alhambra, Cal.
O. M. Robinson, Beverley, 42, West 37th Street, New York.
O. M. Schauffler, Edward W., Kansas City, Missouri.
1911. Stupart, Prof. R. F., Director, Dominion Meteorological Service, Toronto, Canada.
1885. Trudeau, Edward L., Saranac Lake, New York.
O. M. Tyndale, J. Hilgard, Richards Block, Lincoln, Nebraska.
1897. Weber, Sir Hermann, 10, Grosvenor Street, W., London, England.
1897. Williams, Charles Theodore, 2, Upper Brook Street, W., London, England.

Corresponding Members.

1912. Carpenter, Ford A., Weather Bureau, Los Angeles, Cal.
1898. Eyre, G. G., Claremont, Cape Town, South Africa.
1910. Forbes, Mr. N. Hay, F.R.C.S., Church Stretton, England.
1911. Grenfell, Wilfred, C.M.G., St. Anthony, Newfoundland.
1910. Gros, E. L., 23 Ave. du Bois de Boulogne, Paris, France.
1912. Henderson, Yandell, 440, Prospect Street, New Haven, Conn.
1910. Lamb, George, Indian Medical Service, Parel, Bombay, India.
1898. Liceaga, Eduardo, Ca. de Napoles, Numero 37, Mexico.
1908. Liston, W. Glen, D.P.B., Capt., Indian Medical Service, Parel, Bombay Bacteriological Laboratory, Bombay, India.

O. M., Original Member.

ELECTED

1898. Orvananos, Domingo, 25, Chavarri Street, Mexico.
1910. Rogers, Leonard, I.M.S., F.R.C.S., School of Medicine, Calcutta, India.
1904. Sandwith, Fleming Mant, 31, Cavendish Square, W., London.
1898. Sunderland, Septimus, 11, Cavendish Place, Cavendish Square, W., London.
1902. Weber, F. Parkes, 19, Harley Street, W., London.
1907. Wellman, F. Creighton, Tulane University, 1551, Canal Street, New Orleans, La.
1907. Williams, Leonard, 123, Harley Street, W., London.

Active Members.

1897. Alton, Charles D., 1310, Asylum Avenue, Hartford, Conn.
1898. Anders, Howard S., 115, So. 20th Street, Philadelphia.
1899. Anders, James M., 1605, Walnut Street, Philadelphia.
1890. Anderson, B. P., 106, N. Cascade Avenue, Colorado Springs, Col.
1900. Arnold, Horace D., 427, Beacon Street, Boston.

1893. Babcock, R. H., 44, Bellevue Pl., Chicago.
1898. Baldwin, Edward R., Saranac Lake, N.Y.
1901. Barlow, W. Jarvis, Security Building, Los Angeles, Cal.
1907. Barnes, Harry Lee, Wallum Lake, R.I.
1902. Bergtold, William H., 1159, Race Street, Denver, Col.
1906. Billings, John S., jun., 32, East 53rd Street, New York City.
1897. Blackader, Alexander D., 236, Mountain Street, Montreal, Canada.
1895. Boardman, W. S., 63, Mt. Vernon Street, Boston.
1897. Bonney, S. G., Stedman Building, Denver, Col.
1885. Bowditch, V. Y., 506, Beacon Street, Boston.
1901. Bracken, Henry Martyn, 1010, Fourth Street, S.E., Minneapolis, Minn.
1891. Brannan, John W., 11, West 12th Street, New York City.
1894. Bridge, Norman, Temple Auditorium, Los Angeles, Cal.
1903. Brown, Lawrason, Saranac Lake, N.Y.
1903. Brown, Philip King, 350, Post Street, San Francisco, Cal.
1897. Brown, Sanger, Reliance Building, Chicago.

ELECTED

1907. Browning, Charles C., Story Bldg., Los Angeles, Cal.
1909. Bushnell, George E., U.S.A., Fort Bayard, New Mexico.
1886. Butler, G. R., 229, Gates Avenue, Brooklyn.

1896. Campbell, W. A., 424, N. Nevada Ave., Colorado Springs, Col.
1910. Carrington, P. M., U.S.M.H. and P.H. Service, St. Louis, Mo.
1898. Casselberry, W. E., 15, East Washington Street, Chicago, Ill.
1906. Claytor, Thomas A., 1826, R. Street, N.W., Washington, D.C.
1901. Cobb, J. O., U.S.M.H.S., Marine Hospital, Chicago.
1894. Coleman, Thomas D., 505, Greene Street, Augusta, Ga.
1901. Collins, Charles Farnham, 50, West 55th Street, New York City.
1889. Coolidge, A., jun., 613, Beacon Street, Boston.
1902. Craig, R. W., Phœnix, Arizona.
1910. Crane, Bayard T., Rutland, Mass.
1885. Curtin, R. G., 22, South 18th Street, Philadelphia.

1907. Da Costa, John C., jun., 264, South 15th Street, Philadelphia.
1892. Daland, Judson, 317, South 18th Street, Philadelphia.
1890. Darlington, Thomas, 27, Washington Square North, New York City.
1907. Darnall, Wm. Edgar, 1704, Pacific Ave., Atlantic City.
1897. Davis, N. S., 7, West Madison Street, Chicago.
1910. Dixon, Samuel G., Harrisburg, Penn.
1905. Dunn, William LeRoy, Asheville, N.C.

1897. Edson, Carroll E., McPhee Building, Denver, Col.
1903. Edwards, William A., Security Building, Los Angeles, Cal.
1903. Elliott, J. H., 11, Spadina Road, Toronto, Canada.
1892. Elsner, H. L., Fayette Park, Syracuse, N.Y.

1912. Farrand, Livingston, 105, East 22nd Street, New York.
1910. Floyd, Cleaveland, 1398, Beacon Street, Boston, Mass.

ELECTED

1885. Ford, Willis E., 266, Genesee Street, Utica, N.Y.
1911. Fulton, Frank Taylor, 36, Prospect Street, Providence, R.I.

1896. Gardiner, C. Fox, 818, North Cascade Avenue, Colorado Springs, Col.
1886. Garnett, A. S., Hot Springs, Ark.
1898. Getchell, Albert C., 6, Linden Street, Worcester, Massachusetts.
1892. Gibson, William M., 260, Genesee Street, Utica, N.Y.
1909. Griffin, Walter Alden, Sharon, Mass.

1907. Hall, J. N., Jackson Building, Denver, Col.
1912. Hamman, Louis V., 714, Park Avenue, Baltimore.
1893. Hance, I. H., Lakewood, N.J.
1891. Hart, James A., Geneva, N.Y.
1900. Harvey, Thomas W., 463, Main Street, Orange, N.J.
1912. Hastings, Thomas W., 172, East 71st Street, New York.
1912. Hatfield, Charles J., 2008, Walnut Street, Philadelphia.
1896. Heffron, John L., 528, South Salina Street, Syracuse, N.Y.
1912. Hewlett, A. Walter, 1835, Cambridge Road, Ann Arbor, Michigan.
1893. Hinsdale, Guy, Hot Springs, Va.
1902. Hoagland, Henry W., 818, North Nevada Avenue, Colorado Springs, Col.
1905. Huddleston, John H., 145, West 78th Street, New York.

O. M. Ingals, E. Fletcher, Monroe Buildings, 104, Michigan Avenue, Chicago.

1889. Jacobi, A., 19, East 47th Street, New York.
1888. Jayne, W. A., 416, McPhee Building, Denver, Col.
1901. Jennings, Charles Godwin, 457, Jefferson Street, Detroit, Michigan.

1910. Kahlo, George D., White Sulphur Springs, West Virginia.
1904. King, Herbert Maxon, Liberty, New York.
1907. Kinghorn, Hugh M., 14, Church Street, Saranac Lake, N.Y.
1899. Klebs, Arnold C., care of J. M. Forbes and Co., Sears Bldg., Boston.

ELECTED

1903. KYLE, D. BRADEN, 1517, Walnut Street, Philadelphia.

1910. LANDIS, H. R. M., 11, South 21st Street, Philadelphia.
1887. LANGMAID, S. W., North Sutton, N.H.
1899. LE FEVRE, EGBERT, 52, West 56th Street, New York.
1909. LOCKE, EDWIN ALLEN, 311, Beacon Street, Boston, Mass.
1904. LOWMAN, JOHN H., 1807, Prospect Ave., S.E., Cleveland, O.
1907. LYMAN, DAVID RUSSELL, Wallingford, Conn.

1906. MANGES, MORRIS, 72, East 79th Street, New York.
1910. MARCY, ALEXANDER, Riverton, N.J.
1902. MARVEL, PHILIP, 1616, Pacific Avenue, Atlantic City, N.J.
1887. MAYS, THOMAS J., 1829, Spruce Street, Philadelphia.
1905. MILLER, JAMES ALEXANDER, 18, West 51st Street, New York.
1909. MINER, CHARLES H., 115, South Franklin Street, Wilkesbarre, Pa.
1909. MINER, STANLEY G., 58, Cadillac Square, Detroit, Mich.
1899. MINOR, CHARLES L., Asheville, N.C.
1909. MORGAN, JAMES DUDLEY, 919, Fifteenth Street, N.W., Washington, D.C.

1895. NEWTON, R. C., 42, Church Street, Montclair, N.J.
1907. NICHOLS, ESTES, Y.M.C.A. Building, Portland, Maine.
1907. NICHOLS, JOHN B., 1321, Rhode Island Ave., N.W., Washington, D.C.
1912. NORRIS, GEORGE W., 1530, Locust Street, Philadelphia.

1888. OTIS, E. O., 381, Beacon Street, Boston.

1912. PATERSON, ROBERT CHILDS, Ste. Agathe des Monts, Province of Quebec, Canada.
1887. PEALE, A. C., National Museum, Washington, D.C.
1906. PERKINS, JAY, 106, Waterman Street, Providence, R.I.
1895. PHILLIPS, W. F. R., Mobile, Alabama.
1887. PLATT, WALTER B., 802, Cathedral Street, Baltimore.
1902. POTTENGER, F. M., 1100, Title Insurance Building, Los Angeles, Cal.
1905. PRATT, JOSEPH H., 317, Marlborough Street, Boston.
1905. PRYOR, JOHN H., 26, Linwood Ave., Buffalo, New York.

1891. QUIMBY, CHARLES E., 278, West 86th Street, New York.

ELECTED

1885. RICE, C. C., 123, East 19th Street, New York.
1901. RICHARDSON, CHARLES W., 1317, Connecticut Avenue, Washington, D.C.
1904. RICHER, A. J., Ste. Agathe des Monts, Province of Quebec, Canada.
1890. ROBINSON, W. D., 2012, Mount Vernon St., Philadelphia.
1902. ROCHESTER, DELANCEY, 469, Franklin Street, Buffalo, N.Y.
1892. ROE, JOHN O., 44, South Clinton Street, Rochester, N.Y.
1890. ROGERS, E. J. A., 222, Colfax Avenue, Denver, Col.

1905. SCHAUFFLER, WILLIAM GRAY, 400 Madison Ave., Lakewood, N.J.
1901. SEWALL, HENRY, 433-4, Majestic Building, Denver, Col.
1910. SHURLY, B. R., 32, Adams Avenue W., Detroit, Mich.
O. M. SHURLY, E. L., 32, Adams Avenue, W., Detroit, Mich.
1890. SMITH, A. ALEXANDER, 18, West 51st Street, New York.
1887. SMITH, FRANK FREMONT, 1808, Massachusetts Ave., Washington, D.C.
1911. STEINER, WALTER R., 4, Trinity Street, Hartford, Conn.
1909. STEVENS, MARTIN L., Asheville, N.C.
1904. STONE, ARTHUR K., 543, Boylston Street, Boston, Mass.
1910. SWAN, JOHN M., 457, Park Avenue, Rochester, New York.
1901. SWAN, WILL HOWARD, 1440, North Nevada Avenue, Colorado Springs, Col.

1892. TAYLOR, H. LONGSTREET, 75, Lowry Arcade, St. Paul, Minn.
1907. TAYLOR, J. GURNEY, 6041, Drexel Road, Philadelphia.
1896. TAYLOR, J. MADISON, 1504, Pine Street, Philadelphia.
1912. THAYER, W. S., 406, Cathedral Street, Baltimore.
1910. THOMAS, JOHN D., 1726, M Street, N.W., Washington.

1897. WHITCOMB, H. H., Norristown, Pa.
1911. WHITE, WILLIAM CHARLES, Bedford Ave. and Wandless St., Pittsburg, Pa.
1898. WHITNEY, HERBERT B., 320, Temple Court, Denver, Col.
1885. WILLIAMS, H. F., 416, Grand Avenue, Brooklyn.
1898. WILLIAMS, HAROLD, 528, Beacon Street, Boston.
1911. WILLIAMS, LINSLY R., 882, Park Avenue, New York City.
1910. WILSON, GORDON, 1315, North Charles Street, Baltimore
O. M. WILSON, JAMES C., 1509, Walnut Street, Philadelphia.

Total, 136 active members.

MINUTES.

The Twenty-ninth Annual Meeting of the Association was called to order by the President, Dr. Alexander Blackader, of Montreal, at The Allyn House, Hartford, Conn., June 10, 1912, at 10 A.M.

The following members were present during the meeting:—

Dr. C. D. Alton,
Dr. J. M. Anders,
Dr. H. D. Arnold,
Dr. R. H. Babcock,
Dr. E. R. Baldwin,
Dr. H. L. Barnes,
Dr. A. D. Blackader,
Dr. W. S. Boardman,
Dr. V. Y. Bowditch,
Dr. J. W. Brannan,
Dr. L. Brown,
Dr. G. R. Butler,
Dr. W. A. Campbell,
Dr. T. A. Claytor,
Dr. T. D. Coleman,
Dr. C. F. Collins,
Dr. B. T. Crane,
Dr. R. G. Curtin,
Dr. J. Daland,
Dr. T. Darlington,
Dr. W. L. Dunn,
Dr. C. E. Edson,
Dr. J. H. Elliott,
Dr. Cleaveland Floyd,
Dr. F. T. Fulton,
Dr. C. F. Gardiner,
Dr. W. A. Griffin,
Dr. J. N. Hall,
Dr. G. Hinsdale,
Dr. H. W. Hoagland,
Dr. A. Jacobi,
Dr. W. A. Jayne,
Dr. G. D. Kahlo,
Dr. H. M. King,
Dr. H. M. Kinghorn,
Dr. H. R. M. Landis,
Dr. E. A. Locke,
Dr. D. R. Lyman,
Dr. M. Manges,
Dr. T. J. Mays,
Dr. C. L. Minor,
Dr. Jay Perkins,
Dr. F. M. Pottenger,
Dr. J. H. Pratt,
Dr. C. E. Quimby,
Dr. A. J. Richer,
Dr. W. D. Robinson,
Dr. Delancy Rochester,
Dr. W. R. Steiner,
Dr. A. K. Stone,
Dr. J. Gurney Taylor,
Dr. J. Madison Taylor,
Dr. J. D. Thomas,
Dr. H. H. Whitcomb,
Dr. W. Charles White,
Dr. Linsly R. Williams,
Dr. H. F. Williams,
Dr. Gordon Wilson.

There were present as guests Professor Yandell Henderson, of Yale University; Dr. E. T. Bradstreet, President of the Connecticut State Medical Society; Dr. O. C. Smith, President of the Hartford Medical Society; and Dr. Henry F. Stoll, of Hartford.

Secretary and Treasurer's Report.

This Association has completed twenty-eight years of its existence. During the past year there have been the following changes in membership: Dr. Henry Barton Jacobs, Baltimore, Md.; Dr. C. E. Nammack, New York, N.Y.; and Dr. James E. Stubbert, New York, N.Y., have resigned. The following has ceased to be a member under the Article III, Section 4, of the Constitution: Dr. Walter Lindley, Los Angeles, Cal. We have lost by death: Dr. John A. Wilder, on September 14, 1911; Dr. Agrippa N. Bell, on October 15, 1911; Dr. Walter Wyman, on November 20, 1911. Memorial notices of these members were added to the last volume of *Transactions*. Dr. Leonard Weber, of New York, an Honorary Member, on March 1, 1912; he was elected an active member in 1895 and an Honorary Member in 1906. Dr. John H. Musser, of Philadelphia, who was elected an active member in 1886, died April 4, 1912. Dr. Richard A. Cleemann, of Philadelphia, who was elected an active member in 1898, died November 19, 1912. Memorial notices of Dr. Weber, Dr. Musser, and Dr. Cleemann are appended (see pp. xxvii-xxx).

Financial Statement.

June 1, 1911. Balance in hand	$359.90	
Received, cash	816.58	
Total	$1,176.48	
Expenses		$1,013.30
June 1, 1912. Balance in hand		163.18
		$1,176.48

The twenty-seventh annual volume has been printed and distributed as usual. It is the largest volume issued during the last ten years. The Association has been invited to participate in the Fifteenth International Congress on Hygiene and Demography, to be held in Washington, September 23-28, 1913.

We have also been asked to appoint a member of the Executive Committee and of the Committee of Arrangements

of the Ninth Congress of American Physicians and Surgeons, to be held in Washington, May 6, 7 and 8, 1913.

Reports have been received from various members who are unable to attend the present meeting.

The minutes of the Council meeting held in Philadelphia, January 19, 1912, were read.

The President then appointed as a Nominating Committee, Drs. Babcock, Baldwin, Brannan, Coleman, and Darlington; as an Auditing Committee, Drs. Daland and Rochester.

Dr. Madison Taylor moved that the appointment of delegates to the Congress on Hygiene and of a delegate to the Executive Committee of the Congress of Physicians and Surgeons and of a member of the Committee of Arrangements be referred to the Council. Carried.

Business Session held June 12, 1912, at 12.30 p.m.

The Committee on Nominations reported the following recommendations for officers for the ensuing year:—President, Dr. C. L. Minor; Vice-President, Dr. J. M. Anders; 2nd Vice-President, Dr. C. D. Alton; Secretary and Treasurer, Dr. G. Hinsdale; Member of the Council, Dr. Judson Daland.

Dr. Rochester reported on behalf of the Auditing Committee that they had examined the Treasurer's books and found the accounts correct. It was moved and seconded that the report be accepted.

Dr. Edson moved that the report of the Nominating Committee be accepted, and that the Secretary cast a ballot for the officers as nominated. Carried.

The Secretary cast the ballot, and announced the foregoing duly elected officers for the ensuing year.

Dr. C. L. Minor made a report for the Committee on signs and symbols in recording physical findings in the thorax, and asked that the Committee be continued.

Dr. Vincent Y. Bowditch read on behalf of Dr. Otis the report of the Committee on "What is a Tuberculosis Sanatorium?" (see page xviii).

Dr. Baldwin moved that the report be adopted and sent to the Secretary of the National Association for the Study and Prevention of Tuberculosis for consideration by the Directors. Carried.

The Association proceeded to the election of new mem-

bers, the following being elected honorary members: Dr. Samuel A. Fisk, Dr. G. E. Abbot, Dr. James A. McBride. Professor Yandell Henderson, of New Haven, and Mr. Ford A. Carpenter, of Los Angeles, were elected corresponding members. Dr. Livingston Farrand, of New York; Dr. Thomas W. Hastings, of New York; Dr. A. W. Hewlett, of Ann Arbor; Dr. W. T. Longcope, of New York; Dr. George W. Norris, of Philadelphia; Dr. Charles J. Hatfield, of Philadelphia; Dr. W. S. Thayer, of Baltimore; Dr. Robert Childs Paterson, of Ste. Agathe des Monts, Quebec; and Dr. Louis Hamman, of Baltimore, were elected active members.

An invitation was read, signed by all the Colorado members present, to meet in Colorado in 1914. An invitation was also given to the Society to meet in Asheville.

A list of those proposed for membership in 1913 was read. A vote of thanks was passed to both Committee of Arrangements for their efforts to make the meeting a success; also to the Hartford Medical Society for their courtesy to members in inviting them to the smoker and for the use of the Hunt Memorial for the meeting.

The Society then adjourned.

The annual dinner was held at the Hartford Golf Club, fifty-two attending, and Dr. C. W. Alton acting as toastmaster. On June 13 the members remaining were invited to an automobile trip and a luncheon at the Gaylord Farm Sanatorium at Wallingford.

GUY HINSDALE, *Secretary*.

"WHAT CONDITIONS SHOULD EXIST IN ORDER TO CONSTITUTE A TRUE SANATORIUM FOR PULMONARY TUBERCULOSIS?"

THE above subject is the result of a paper* read by Dr. E. O. Otis at the Montreal meeting of the American Climatological Association in June, 1911. The President appointed a committee who should draw up certain recom-

* *Transactions* of 1911, page 161.

mendations bearing upon this subject and present them at the next meeting of the Association.

The Committee has carefully considered the subject, and appends the following recommendations for the benefit of those who have charge of sanatoria and for those who intend to construct similar institutions. The recommendations are hereby presented as a unanimous report for the approval, or otherwise, of the Association.

Recommendations.

(1) The word "sanatorium" as derived from the Latin word "sanare," to heal, should signify an institution where people go to be healed of disease. To fulfil this purpose in the case of pulmonary tuberculous disease, the committee believe that such institutions should confine their attention to the strictly hopeful cases, and primarily to the incipient cases. Inasmuch as it has been shown that in our present stage of development it is practically impossible to confine ourselves to the absolutely incipient cases, and inasmuch as brilliant results are often obtained in those which are "moderately advanced" or in the "second stage" of the disease, such cases should also be admitted for treatment when the judgment of those competent to decide warrants such procedure.

(2) From the experience of the majority of those who have charge of such institutions, the Committee believe that the admission of far-advanced and practically hopeless cases has a distinctly depressing and hence deleterious effect upon the more hopeful cases, and that therefore the former should not be admitted to sanatoria, but should be sent to hospitals established especially for advanced cases in or near the cities or towns from which they come.

Methods of Application and Admission to State Sanatoria.

(3) While not intending to enter the discussion as to best methods of construction or of administration, the Committee believe that some expression on the part of this Association as to methods of admission is advisable. It is a very noticeable fact that if the selection of cases deemed suitable for admission be thrown open to the profession at large without restrictions, a large number of patients will be sent who are unfit for true sanatorium treatment, thereby filling places which should be given only to hopeful cases.

The experience of Massachusetts serves as an example. In the early days of the Rutland Sanatorium, examinations were made only by specialists in the disease. Later, small tribunals selected in different parts of the State were substituted for the early method. Still later, patients were admitted on the recommendation of any respectable physician in the State, with the consequence, for various reasons, that a large number of hopeless cases were admitted which never should have left the community in which they lived, except to be sent to some special local hospital. This resulted in harm to the institution as a sanatorium properly speaking, an injury which is now fortunately being rapidly rectified by a more rigid investigation of each case when presented at the office of the Tuberculosis Commission in Boston.

For these reasons, the Committee believe it to be wise that this Association should recommend that in every sanatorium some such tribunal should exist before which each application should be brought for final decision as to whether the case is suitable or not for sanatorium treatment in the strict sense of the word.

(4) They would also recommend, to all who contemplate the erection of sanatoria, the serious consideration of plans for the establishment of a "probation or reception building," to be placed at a considerable distance from the sanatorium itself, where cases may be closely observed to determine whether they are suitable for sanatorium treatment or not. They would stipulate, however, that such a building should not be, for obvious reasons, in close proximity to the chief institution, and that if patients are found to be unsuitable they shall not be admitted to the sanatorium. Such a plan, even if it involves some extra expense, would in the opinion of the Committee be in the end of greater benefit to the State, and hence a wise economical measure.

Submitted on behalf of the Committee,

Vincent Y. Bowditch,
Charles L. Minor,
Lawrason Brown,
Cleaveland Floyd,
J. H. Elliott,
David Lyman,
E. O. Otis, *Chairman*.

REPORT OF THE SEVENTH INTERNATIONAL CONGRESS ON TUBERCULOSIS, HELD IN ROME, APRIL 14 TO 21, 1912.

By ARTHUR J. RICHER, M.D.,

AND

EDWARD O. OTIS, M.D.

Acting as one of the delegates to the Seventh International Congress on Tuberculosis, held in Rome, April 14 to 21, I beg leave to report upon matters which were submitted to the members of the Congress and in addition wish to submit material collected throughout Europe during the six months which preceded it.

The Congress.

It was well attended in spite of its having been deferred from the autumn of 1911. With few exceptions, the various countries of the world were represented by one or more delegates. The Italian profession flocked to Rome from every corner of the Kingdom, while many of the Italian savants spared no efforts to bring enlightenment to their own countrymen, giving the foreign delegates every opportunity to benefit by the fruit of their labours.

One naturally asks, what was the chief feature of interest brought out at such a gathering?

There were many interesting communications. In chemio-therapy and helio-therapy much promising material was submitted both at the Congress and the Conference. The social aspect of the question was well presented by numerous representatives, showing that all civilized countries were quite thoroughly organized in that department. Compulsory notification was pretty fully discussed, winning over a goodly majority of the delegates to the need of the adoption of such a measure in order to make the crusade truly effective.

The influence of alcohol as a factor in the dissemination of tuberculosis was strongly emphasized by a large number of medical authorities.

As at former Congresses the burning question was that

of bovine and human tuberculosis, their difference and relationships being fully discussed. In the scope of this report one could not attempt to bring out any part of the discussion. The conclusions adopted finally were but the result of compromise on both sides, and these resolutions were only framed-up sentences telling what we have long known, *viz.*, that the greatest source of danger to man is man himself—not the much maligned bovine.

The Child and Tuberculosis.

Under this heading much valuable material was offered. The most convincing work was that presented by Calmette, of Lille. In fact it is so important that a brief analysis of it is bound to arouse interest. His contention that infection in tuberculosis occurs during childhood is borne out by facts observed by others as well as himself.

Last year, between January and June, he submitted 1,226 children to the cuti-reaction (Tuberculine). These children were not attending hospitals or dispensaries—they were looked upon as healthy.

The following table gives a good idea of the results:—

Age	Number tested	Infected per cent.
0 to 1 year	273	9
1 ,, 2 years	145	22
2 ,, 5 ,, ...	206	54
5 ,, 15 ,, ...	366	81
Over 15 ,, ...	236	88

Concording with these findings, but obtained from an entirely different source, are those of Harbitz, of Christiania. In this instance he reports upon autopsies made upon children whose death had been caused by various diseases, to the number of 484, with the following results:—

	Per cent.	
First year of life	20	were found to be infected with tuberculosis.
Second ,, ,, ...	27	
Fourth and fifth year	44	
Sixth to fourteenth ,, ...	75	
Fifteenth ,, ...	85	

Calmette claims that at the age of 20 very few human beings have escaped infection by the tubercle bacillus.

What can this all mean?

For a reply we again have to refer to Calmette's experimental work performed upon calves at the Pasteur Institute at Lille. During the course of these experiments he followed as closely as possible the methods which Nature uses to infect man. Here he found that his animals readily recovered from a first, a second, a third, and, in fact, many infections, if only the animals were given sufficient time in which to recover. In fact, each infection produced a certain degree of immunity if the lapse of time allowed for recovery was sufficiently long; it always took larger quantities to re-infect. From this work Calmette concludes that among human beings tuberculous disease develops when the doses of infecting material are very large or repeatedly absorbed at short intervals.

In any event, one sees in the mechanism of this childhood infection the *rôle* played by Nature to protect or vaccinate—truly, this should point out to us what ought to be the direction of our efforts to assist Nature in her protective work.

Following up this idea of childhood infection, Webb, of Colorado, and Maragliano, of Italy, reported at the Congress attempts to vaccinate children, expressing the hope at the same time that it might yet become possible to do this with a determinate dose of living bacilli injected into the subcutaneous tissues.

Webb's experimental work was done with monkeys; the account of it appearing in the *Transactions* of the Congress will prove interesting reading.

Curative Measures.

Here, of course, endless modifications of older methods were advocated—entirely new methods were also submitted for appreciation. Among the new methods may be mentioned the attempt at curing tuberculous disease by injecting directly into the blood-stream different chemical reagents. Among the most notable was that advocated by Finkler, of Bonn, consisting of aniline colours with iodine and a copper salt. The results thus far have not been very convincing, but this mode of treatment is being persistently applied by the German school, and much is hoped for it eventually. Open air methods with generous feeding still remain dominant as the curative factors giving the most uniformly good results.

Right here I may be allowed to mention and perhaps *outline* a method of treatment developed in England depending upon fresh air and generous feeding, but systematized.

I was sorry to find that no report upon this method was made at the Congress. To my mind it is the one advance made of late years in the hygieno-dietetic treatment. I wish to refer to the Frimley method. The Frimley Sanatorium is the suburban annex of the Brompton Hospital for Consumptives in London. About eight years ago, Dr. Marcus Paterson became Superintendent at Frimley, and there worked out this method of graduated exercise and labour with periods of absolute rest—splinted rest, so to speak. His report upon results obtained, published in the fall of 1911, was decidedly encouraging.

Among the advantages of this method are the following:—

(1) It gives every individual affected with tuberculosis some chance of recovery—many cases who seemed hopelessly ill have recovered completely at Frimley.

(2) The Hospital for Incurables becomes unnecessary since patients in every stage of the disease are admitted with some expectation of recovery.

(3) No special climate or altitude are needed—fresh air, generous feeding, and supervised exercise with gradually increased labour form the basis of the treatment.

(4) The duration of the treatment is shortened by nearly one-half.

(5) Tendency to relapse is reduced to a minimum.

(6) Employment during the treatment avoids making unfits of recovered patients such as the reclining chair frequently does.

The basic principle upon which the Frimley method is founded is *resistance*. In tuberculosis this factor resistance has been quite generally understood of late years. "Increase the physical resistance of your patient and he straight away gets well," is a phrase now in common use by phthisiologists.

I have said that the Frimley method is systematized—in reality it is a system which meets most of the needs of the tuberculosis problem. Founded as it is upon a principle which is rapidly being accepted wherever known it reduces the treatment to a simple formula. Restore the broken-down

resistance of the patient, whether he be in the first, second, or third stage of the disease matters not; he has some chance of recovery even in the third stage; that is what makes the Frimley method worth while; there is no need of a hospital for incurables.

The hospital for incurables is what actually discourages the patient most of all, but think of the philanthropist whose help is sought to build and equip a refuge for the incurables from a disease which is known to be curable. There remains nothing to explain; it is clear that the position we have taken in the past is not right.

Now think of the infection as occurring in childhood, and the disease developing in adolescence or later, then the mechanism of resistance appears in a new, a different light. Broken-down resistance is really the great factor in the development of tuberculous disease after all. Everybody knows the conditions which bring this about—it is a large sociological problem which is being faced by all civilized countries. We may yet come to the conclusion that infection in the adult is quite secondary as a producer of tuberculous disease. Infection in the child may yet be accepted as Nature's method of protecting life. We should read these signboards more attentively.

Respectfully submitted, A. J. Richer.

As one of the delegates appointed by this Society to the International Tuberculosis Congress at Rome, I am glad to subscribe to the report of my colleague, Dr. Richer, although with not quite the enthusiasm which he expresses in regard to the so-called Frimley method of treatment. *Resistance*, of course, is what we all endeavour to establish, however we go about it. In some cases we succeed and in others we fail, whatever the method of treatment pursued. Not all cases are suited to or will respond to the system of graduated work. As with every form of treatment, there must be individual application.

In addition to Dr. Richer's report I should like to emphasize the importance given to artificial pneumothorax at the Congress, and I can best and most briefly do so by quoting the resolution passed at the Congress, which is as follows: "The Congress, as a result of the reports and the

most interesting discussion upon them regarding artificial pneumothorax, which was first instituted and developed by Professor Forlanini, of Pavia, expresses its indebtedness to Professor Forlanini, and also to Professors Brauer, Sangmann, Durnarest, and all the colleagues who have brought to the Congress the important contributions of their experience upon this subject; and, furthermore, express the conviction that this method of treatment (artificial pneumothorax) should receive a wide application."

There was a long list of other resolutions passed regarding compulsory registration, dispensaries, bovine and human tuberculosis, instruction in schools upon tuberculosis, protection of children, seaside sanatoria for surgical tuberculosis in children, hygienic education in the family, and industries carried on in the home.

Subsequent to the Congress I visited various clinics and sanatoria in different parts of Europe, among them that of Professor Forlanini, at Pavia, and Brauer's, of Hamburg, and found much interest displayed and much work done in artificial pneumothorax. This method of treatment, particularly in cases which have been resistant to the usual means, and have been previously considered hopeless, is, in my opinion, one of the greatest advances made in later years in the treatment of tuberculosis. As one of the assistants in Professor Forlanini's clinic said, "It gives a case, otherwise doomed, another chance."

Edward O. Otis.

MEMORIAL.

LEONARD WEBER, M.D.

Dr. Weber was born in Bavaria, Germany, on May 22, 1837. He was graduated in medicine at the University of Erlangen in 1860, and in 1863 began practice in New York. For several years he was associated with the Northern Dispensary in Waverley Place, and he was among the first who operated for abscess of the vermiform appendix. From 1867 to 1870 Dr. Weber was visiting physician to St. Francis Hospital. In 1890 he founded St. Mark's Hospital, New York, with the money contributed by his friends and himself. In 1895 he was elected professor of general medicine in the Post Graduate Medical School of New York, and remained one of the faculty until 1910. Dr. Weber was an active member of the leading medical societies, as well as a member of the Republican and the German clubs and the Liederkranz. On October, 1910, the medical faculty of the University of Erlangen honoured Dr. Weber by renewing the diploma given him fifty years before. Dr. Weber leaves a widow.

JOHN H. MUSSER, M.D., LL.D.

Dr. Musser was born in Strasburg, Lancaster County, June 22, 1856. He was educated at Millersville State Normal School, and graduated from the medical department of the University of Pennsylvania in 1877.

Dr. Musser visited William Osler last summer, and returned home to Philadelphia with the knowledge given him by that accurate diagnostician that he was to die within a few months, that he should relinquish his work and endeavour to relieve his distressing symptoms. This hero, however, returned to Philadelphia and to his work in full activity; he said nothing to family or friends of the knowledge that Osler had imparted to him, but gave himself unsparingly and freely to his professional duties until he could no longer fill them from lack of physical strength.

Then he informed his intimates that the end had come. Dr. Musser faced the last enemy undaunted, passing into another world thinking only of others, committing himself in simple trust to the Eternal Goodness. Is this not more heroism than facing guns and cannons with cheers and comrades?

He was pathologist to the Presbyterian Hospital, 1884-1888; Assistant Professor of Clinical Medicine, University of Pennsylvania, 1889-98; President of the Pathological Society, 1895-1897; President of the Philadelphia Co. Medical Society, 1899; President of the Philadelphia Medical Club; member of the Council of the Association of American Physicians, 1893-98; President of the American Medical Association, 1903. He was a Fellow of the College of Physicians, the Association of American Physicians, the Philadelphia Neurological Society, the Philadelphia Pathological Society, the Medical Society of Ontario, the Harrisburg Academy of Medicine, honorary member of the Medical Association of the State of New York and of the South Carolina Medical Society, Fellow of the American Association for the Advancement of Science and of the Virginia Medical Society. He had been for twenty-six years a member of our Association, and in 1895 served as Vice-President.

At the time of his death Dr. Musser was connected with the medical staff of the University of Pennsylvania, physician to the University, Philadelphia and Presbyterian Hospitals; consulting physician in the West Philadelphia Hospital for Women, Germantown Hospital, Chestnut Hill Hospital, Jewish Hospital, and the Mercy Hospital of Springfield, Mass. He was the author of a well-known work on "Medical Diagnosis," and contributed to a number of standard works, as Hare's "System of Therapeutics" and Wood's "Reference Handbook of Medical Sciences." He edited Volume IV of Nothnagel's "Practice," and very recently in collaboration with the late Dr. A. O. J. Kelly edited a three volume treatise on "Practical Treatment." At the time of his death he was a member of the Union League, the Rittenhouse, the University, and the Franklin Inn Clubs, and a Trustee of the Drexel Institute.

In 1880, Dr. Musser married Miss Agnes Harper. He is survived by three daughters and one son, Dr. John H. Musser, Jun. The death of Dr. Musser has deprived the

DR. RICHARD A. CLEEMANN.

Born, February 22, 1840. Died, November 19, 1912.

world of a useful, unselfish friend, and the medical world of a faithful servant. While he was a scientist and a scholar of international renown, his learning and skill were freely placed at the service of the ignorant, the lowly, and needy.

Dr. RICHARD A. CLEEMANN.

Dr. Richard A. Cleemann was born in Philadelphia, February 22, 1840, his father being Gustavus Bernard Christian Cleemann, a Russian, and his mother formerly Miss Colquhoun, of Virginia. It was through the latter that he was connected with the well-known Virginia family of Cabells.

He graduated from the University of Pennsylvania in 1859, and received his degree of M.D. in 1862. Immediately after this Dr. Cleemann offered his services to the Union Army, and for the remainder of the Civil War he served as an assistant surgeon.

At the termination of this service he began practice. From 1872 to 1879 he was physician to St. Mary's Hospital. The next eight years he was a member of the Philadelphia Board of Health. From 1887 to 1892 he was Director of Charities and Corrections. He was then made a member of the State Quarantine Board, and for some years served as President of that body. He was also a member of the Board of Managers of the Pennsylvania Institution for Instruction of the Blind.

Dr. Cleemann was a Fellow of the College of Physicians, a member of the Philadelphia County Medical Society, the International Medical Congress of London, 1881, the Pathological Society, the Obstetrical Society of Philadelphia, the American Academy of Medicine, the Pediatric Society, the American Philosophical Society, the Society of Colonial Wars in Pennsylvania, the American Academy of Political and Social Science, and the Rittenhouse Club. In 1898 he became a member of the Climatological Association, and was one of those who made the trip to California to attend the meeting in 1902.

Notwithstanding the exacting requirements of a large private practice and his hospital and other public duties, Dr. Cleemann found time to write numerous papers on medical subjects for medical journals. His reports on meteorology and epidemics in the *Transactions* of the College of

Physicians are full and complete, and attracted widespread attention among the profession.

In the social life of Philadelphia Dr. Cleemann, who was a bachelor, was extremely popular. Both he and his twin brother, who was trust officer of the Pennsylvania Company, were invited to almost every large social function and enjoyed the widest acquaintance in the life of the city.

Before, and even after his retirement from active practice, several years ago, Dr. Cleemann gave up much of his time to charity patients, and it was said to-day in this connection that no Philadelphia physician would be more missed among the poor than he. Dr. Cleemann returned a few weeks ago from a summer spent in Paris.

He died suddenly of heart disease, a few hours after attending a dinner of the Society of Colonial Wars, November 19, 1912.

As a member of the Board of Health of Philadelphia, as Director of Charities and Corrections, and as Pennsylvania State Quarantine Commissioner he gave the most valuable public service in directions that benefited the entire country. His accurate attention to any duty imposed upon him made him constantly called upon, and he never refused his aid to any cause that he felt he could give.

He was active in the work of the American Philosophical Society, and was a Secretary for some years. For over twenty years he was a Manager of the Blind Institution, which was full of interest that appealed to him, and he was most judicious in his suggestions connected with the health and training of the pupils of that school.

Probably his Russian descent made the acquisition of languages less difficult than with most persons, and he had a useful knowledge of many foreign tongues. He made frequent visits to Europe, and had a very large fund of general information.

He gave the impression at once, to those with whom he came in contact, of a man of the highest standards in life. A thoroughly well-bred man, he was most kindly in his feelings and was a devotedly true and loyal friend to those who had claims of any kind upon him. His professional generosity was of the broadest kind, and there are many who to-day do not know where to turn for that care and attention in time of sickness and distress in which he had always relieved them.

HENRY SAYRE ORME, M.D.

Dr. Orme, an original member of this Association and later an honorary member, died in Los Angeles, November 27, 1912, aged 76. He was one of the pioneer practitioners in Los Angeles, having graduated from New York University in 1861. He was Professor of Hygiene and Preventive Medicine in the University of Southern California. He was most highly regarded by his associates, and showed the greatest hospitality to the members of this Association when visiting Los Angeles in 1902. He was Vice-President in 1903.

CONSTITUTION AND BYE-LAWS.

CONSTITUTION.

Article I.—Name.

This Society shall be known as the American Climatological Association.

Article II.—Object.

The object of this Association shall be the study of *Climatology and Hydrology and of Diseases of the Respiratory and Circulatory Organs.*

Article III.—Membership.

Section 1.—This Association shall consist of *active, corresponding*, and *honorary* members, the former not to exceed 150 and the latter not to exceed twenty (20).

Section 2.—Names of candidates for active membership, whose applications shall have been indorsed by *three* (3) active members, shall be sent to the Secretary at or before the annual meeting at the second business session of which they shall be read and then lie over until the next annual meeting, when such as are approved by the Council shall be balloted on. Three (3) black balls shall be sufficient to reject a candidate. The Council shall have power to nominate active members.

Section 3.—The power of nominating honorary and corresponding members shall be vested in the Council. The election shall be conducted in the same manner as that for active members. Honorary members shall enjoy all the privileges, but shall not be allowed to hold any office or cast any vote.

Section 4.—Any member of the Association absent from the meetings, in person or by contributed paper, for three (3) consecutive years, without sufficient cause, shall be dropped from the list of members by vote of the Council.

Article IV.—Officers.

Section 1.—The officers of this Association shall consist of a *President*, two *Vice-Presidents*, a *Secretary and Treasurer*, who, with five other members, shall constitute the *Council* of the Association.

Section 2.—*Nominations.* The officers, including the Council, shall be nominated by a committee of five (5) members, which committee shall be nominated by the President at the first session of each annual meeting and shall report at the business meeting.

Section 3.—*Elections.* The election of officers shall take place at the business meeting. A majority of votes cast shall constitute an election.

Section 4.—The President, Vice-Presidents, Secretary and Treasurer shall enter upon their duties at the close of the annual meeting at which they are elected, and shall hold office until the close of the next annual meeting, or until their successors are elected.

Section 5.—Members of the Council, other than the President. Vice-Presidents, Secretary and Treasurer, shall hold office for five (5) years.

Section 6.—*Vacancies.* Any vacancy occurring among the officers of the Association during the year may be filled by the Council.

Article V.—Duties of Officers.

President and Vice-Presidents.

The President and Vice-Presidents shall discharge the duties usually devolving upon such officers. The President shall be *ex-officio* Chairman of the Council.

Secretary and Treasurer.

As Secretary, he shall attend and keep a record of all the meetings of the Association and of the Council, of which latter he shall be *ex-officio* Clerk. At each annual meeting he shall announce the names of all who have ceased to be members since the last report. He shall superintend the publication of the Transactions, under the direction of the Council. He shall notify candidates of their election to membership. He shall send a preliminary notification of the annual meeting two (2) months previous thereto, and the programme for the annual meeting at least two (2) weeks previous to its assembly, to all the members of the Association. He shall also send notification of the meetings of the Council to the members thereof. At each annual meeting of the Association he shall read the minutes of the previous meeting and of all the meetings of the Council that have been held during the current year.

As Treasurer, he shall receive all moneys due, and pay all

debts therewith. He shall render an account thereof at the annual meeting, at which time an auditing committee shall be appointed to report.

Article VI.—Council.

The Council shall meet as often as the interests of the Association may require.

Four (4) members shall constitute a quorum.

It shall have the management of the affairs of the Association, subject to the action of the Association at its annual meetings.

It shall consider the claims of candidates recommended to it for admission to membership.

It shall not have the power to make the Association liable for any debts exceeding in total one hundred dollars ($100), in the course of any one year, unless specially authorised by a vote of the Association.

It shall have the entire control of the publications of the Association, with the power to reject such papers or discussions as it may deem best.

It shall have power to nominate active members at the annual meeting.

The Council shall have power to invite any gentleman, not a member, to read a paper at the annual meeting, on any subject within the scope of the objects of this Association.

The Council shall determine questions by vote, or—if demanded—by ballot, the President having a casting vote.

The Council shall constitute a Board of Trial for all offences against the Constitution and Bye-laws, or for unbecoming conduct, and shall have the sole power of moving the expulsion of any member.

The President, or any two members, may call a meeting, notice of which will be transmitted to every member two (2) weeks previous to the meeting.

Article VII.—Papers.

Section 1.—The titles of all papers to be read at any annual meeting shall be forwarded to the Secretary not later than one (1) month before the first day of the meeting, in order to appear on the printed programme.

Section 2.—No paper shall be read before the Association which has already been printed or been read before another body.

Article VIII.—Quorum.

A quorum for business purposes shall be ten (10) members.

Article IX.—Amendments.

This Constitution may be amended by a four-fifths ($\frac{4}{5}$) vote of all the members present at an annual meeting, provided that notice of the proposed amendment has been printed in the notification of the meeting at which the vote is to be taken.

BYE-LAWS.

(1) Meetings of the Association shall be held annually.

(2) The time and place of the meetings shall be determined by the Council.

(3) The dues of active members shall consist of an annual assessment not to exceed seven and a half ($7.50) dollars. Members in arrears shall not be entitled to vote. Those in arrears for two (2) years may be dropped from membership by recommendation of the Council.

(4) Order of business meeting.

First day:—

Calling the roll of members.
Minutes of previous meeting.
Secretary's and Treasurer's reports.
Appointment of auditing committee.
Appointment of nominating committee.
Report of Council on recommendations for membership.

Second day, Morning session:—

Reports of nominating committee and auditing committee.
Election of officers.
Election of members.
Report of committee on health resorts.
Miscellaneous business.
Adjournment of business meeting.

PRESIDENT'S ADDRESS.

THE ADVANTAGE OF RESIDENCE IN A COLD, DRY CLIMATE IN THE TREATMENT OF SOME FORMS OF DISEASE.

By A. D. BLACKADER, M.D.,

Professor of Therapeutics, McGill University, Montreal.

In opening the twenty-ninth annual meeting of the American Climatological Society, my first duty is to express my appreciation of the honour conferred upon me in electing me as your presiding officer. To repeat what I said at the time of my election, I feel that the honour is not for myself alone, but must be regarded as another instance of the generous and courteous spirit shown at all times by the profession in the United States to their *confrères* in the Dominion lying to the north of them. The honour was accepted in this spirit, and I think I but speak the feelings of the Canadian profession when I say we appreciate your generosity and fully reciprocate your kindly sentiments.

The scientific part of our programme is an unusually full one and contains many papers of much interest. All credit is to be given to our very able secretary for the unflagging interest with which he has attended to its details. You will notice also how very delightfully our good friends in Hartford have arranged for our entertainment.

It is one of the duties of your President to open your meeting with an address on some subject of broad general

interest. In my effort to choose such a topic I found it difficult to select one on which much had not previously been said and written. After some thought I determined to speak of a phase in the climate of my own country and to ask your consideration of the advantages and disadvantages of our severely cold, steady winter in the treatment of some forms of disease. In doing so I must crave your indulgence if in the presentation of my subject I reiterate some facts with which you are well acquainted.

While it must be admitted that our winter months are long and severe and that during that time many of our patients find their way southwards to your more balmy and less rigorous resorts, yet not a few from your more uncertain climate find that the stimulating and health-giving properties of the steadily severe but dry cold of northern Canada, and especially of our Laurentian plateau, confer a vigour not to be obtained elsewhere.

Only to the few, perhaps, is the thought of a sharp, frosty air and a temperature at zero, or many degrees below it, an inspiration. Unfortunately, to most of you, a cold temperature in southern regions is invariably associated with much moisture in the air; and it must be acknowledged that cold with moisture is extremely depressing to the general vitality, and strongly predisposes to irritable conditions of the upper and lower respiratory tract. Nevertheless, it is to be noted that in countries where such conditions prevail for the greater part of the year a particularly resistant breed of men is raised. We have no stronger or hardier immigrant than the Norseman or the Scotch Highlander. Cold climates, however, in which the air is dry, are still more stimulating, and provided that the body-heat is maintained by warm clothing and a proper supply of food, a keen frosty air induces in the sufficiently vigorous the maximum physiological reaction with much increase of

muscular energy, provided the cold is not so intense as altogether to overpower the resistance of the system.

The effect of cold air on the body is two-fold. There is an actual abstraction of heat, which is rarely desirable, and which, so far as possible, should be prevented. In cold air the body loses heat to a slight extent only by evaporation; it, perhaps, loses a little more by radiation, while by conduction the amount lost is often very great and is dependent on the rapidity of movement in the air, and on the amount of moisture it may contain.

On a clear, bright, frosty day, with little wind, but with the temperature many degrees below zero, a person, properly clad, loses very little heat by any one of these three methods and may spend a long time out-of-doors before he becomes conscious of any unpleasant sensation of cold. On the contrary, in New York, with the thermometer above freezing-point and a moisture-laden east wind blowing, any one of us will find it impossible to prevent very depressing sensations of chilliness, due to the rapid extraction of heat.

Much more important, however, from a therapeutic standpoint, than the mere abstraction of heat from the body, is the second effect, *i.e.*, the stimulating action of cold on the delicate sentient nerves of the periphery, and just as a vigorous man reacts to a cold bath and comes out feeling warmer and more full of energy than before he stepped in, so in a cold, frosty air a man with active vaso-motor centre quickly reacts, and the young return from their snow-shoe tramps on nights registering many degrees below zero with faces aglow, extremities warm, and a strong, forcible pulse-beat.

Under the effective stimulation of the cold air both respiration and circulation are strengthened, oxidation is increased, and nutrition becomes more active. This action

is, doubtless, in part due to the effect of cold air on the peripheral afferent nerves of the body, and especially on those which have to do with the sense of temperature. The limit of the influence thus exerted over many important functions of the body has not yet been definitely ascertained by the physiologist, but the observant physician is aware of its great importance. In addition, however, to the action on the cutaneous nerves, a powerful stimulation is also conveyed to the medullary centres by the effect of cold air on the nasal mucous membrane. The pharmacologist knows that his promptest and most effectual route to the vasomotor centre is through stimulation of the Schneiderian membrane, and Howland's experiments in Bellevue Hospital indicate that in cold air we have one of our most effectual remedies to stimulate respiration, to increase vascular tension and to strengthen and often to slow the pulse.

As a rule, cold, fresh air favours natural sleep, provided the body be sufficiently protected to maintain its surface heat. Especially is this the case in the pyrexia of pneumonia, of tuberculosis, and of typhoid. In a few instances only, and those for the most part cases of arteriosclerosis, cold air may act too strongly as a stimulant and interfere with prolonged sleep.

All movement in cold air increases its action in abstracting heat. When the air is very dry a moderate wind augments the amount of stimulation obtainable, but when cold air is also moist a strong wind leads to rapid abstraction of heat, and may give rise to great depression of the vital powers.

Cold has also a markedly stimulating action on the digestive system, provided the cold be not excessive. As a rule, appetite and digestion with all of us are better in the cold, dry days of winter than in warm weather. Explorers who have travelled in Arctic regions tell us of the

enormous quantities of food which have to be served out to labourers, and Dr. Cheadle, in his interesting account of a trip through the North-west, emphasizes the importance of a sufficient amount of food, and especially of fat, for the health and well-being of individuals in cold weather. This increased consumption of food is not attended with any subjective or objective disturbance of health, for any excess is rapidly burnt up in the system. In a few cases, however, the severe cold of winter interferes with digestion, and Dr. Lawrason Brown, in a paper read before the Society some years ago, called attention to the fact that when the digestive system under these conditions failed to respond to the increased demand nutrition was rapidly lowered and vitality impaired. Cold appears also to stimulate the blood-forming organs.

As a result of this stimulation to oxidation and nutrition, the innate resistant powers of the body against toxins and its ability to respond protectively to the assault of infections are greatly increased.

The benefit to be obtained from cold, however, will always depend upon the power of the individual to react, and this power varies greatly with different individuals and appears to be in great measure dependent on vaso-motor tone. In those in whom it is defective, much may be done to increase it by the use of cool or cold water in bathing. This should be begun gradually; a partial sponging at first with cool water, followed promptly by a brisk rub till reaction ensues. In a few days colder water may be employed in the form of a douche or spray; and in time the cold tub may be ordered every morning and may come to be considered as one of the luxuries of the day. Dr. Bridge's recommendation of a daily hot bath is not in my opinion advisable in a Canadian winter, as it tends to induce a paralytic condition of the peripheral nerves with an inability to react promptly to cold impressions.

My experience also leads me to the belief that all those who suffer from any interference with the free passage of air through the nostrils do not react well to cold temperatures and gain little benefit during the winter season. In inflammatory conditions of the larynx and trachea cold air may act as an irritant and do definite harm. Individuals suffering from organic disease of the circulation as a rule stand cold poorly. In a few instances the cold may rouse to increased activity the defective powers of compensation, and distinct improvement may set in, but too often an efficient reaction fails to be elicited, and the severe cold leads to disastrous results. Anæmic patients, as a rule, do well, but require caution in maintaining body heat.

In cold weather the eliminating functions of the skin are very slight, and toxic materials in the system are thrown off almost entirely by the kidneys and intestinal tract. To benefit from a winter in the north both should be in healthy working order. Extreme cold is not desirable for cases of gout, arthritis, or neuritis. For those suffering from advanced degeneration in any organ, for those advanced in years, and for the very young, extreme cold may be distinctly harmful.

Lieut.-Col. C. A. Woodruff, U.S.A., has called attention to the marked difference in resisting power to adverse conditions in the tropics between fair and dark skinned individuals, and gives as an explanation the protecting influence of the pigment in the skin. The fair skinned might be expected to have the advantage with us in the north, but my own observations in hospital wards do not warrant any statement to that effect.

It cannot be too strongly emphasized that all the benefit to be derived from a residence in the north will depend on the completeness with which an outdoor life is lived. Confinement indoors in a heated atmosphere, and, as a rule,

with defective ventilation, must always be regarded as distinctly harmful. This unfortunately is a condition which occurs altogether too frequently in many of our Canadian families.

The value of cold air in the treatment of disease appears to have been first recognized by Dr. Bodington, of Warwickshire, England, a country practitioner who in the year 1840 wrote emphasizing the importance of cold as well as fresh air in the treatment of tubercular patients. "No cold," he says, "is too severe for the consumptive"; and again, "the cooler the air which passes into the lungs the greater will be the benefit which the consumptive patient will derive." Certainly, very remarkable statements for his age. In this country Dr. Loomis appears to have the credit of first suggesting, and Dr. Trudeau the credit of being the first to carry out, the braving of a zero temperature by a sick man along the lines indicated by Brehmer in Germany some years previously. The annual reports from the Adirondack Sanatorium indicate how successful such cold-air treatment may be in the early stages of phthisis, and Dr. Lawrason Brown writes me that he believes that tubercular patients do very much better in cold climates than elsewhere when they are able to withstand the cold and react to it; pyrexia rapidly subsides; anæmia disappears, and digestive troubles of neurotic origin are greatly improved. He also calls attention to the fact that as a rule patients begin to gain in weight whenever cool weather sets in, and unfortunately tend to lose it with the onset of the warmer months.

Dr. Byers and Dr. Paterson write me from Ste. Agathe that in cold weather the rapid and permanent gain in weight, and the improvement in the nervous and mental condition of patients is very remarkable. Night sweats become infrequent, the amount of hæmoglobin rapidly rises, and with the improvement in the local conditions expectoration, dyspnœa,

and cough disappear. I quote these facts not because they are in any way unusual, but because they illustrate the wonderfully stimulating properties of cold air on general nutrition, and on the development of the system's resistant powers.

My own experience also leads me to believe that cold of not too severe a character is of distinct advantage to children over 3 or 4 years of age, and particularly to those children who breathe freely through their nostrils. Many of my patients, anæmic children of tubercular parents, who suffered from enlarged glands and impaired digestion have been greatly improved by a winter spent in the Laurentian plateau.

No other place that I am acquainted with presents so many advantages as a winter resort with a steadily cold dry climate as this Laurentian plateau, which with an altitude of from twelve to fifteen hundred feet stretches more than half-way across our continent, north of the St. Lawrence River and of the Great Lakes. This plateau, the Canadian shield or boss of the earth's crust, constitutes the greater part of the original land area of the North American Continent. The low rounded hills which rise in a series of ranges consist of primæval rocks, which retain in many places the striation made by the slow flow of the tremendous glaciers which in previous ages covered all this plateau, rounding the tops of the hills and filling the valleys with glistening sand. Towards the north this plateau slopes down towards Hudson Bay, and on the south to the Great Lakes and the St. Lawrence, affording perfect drainage by numerous rapidly flowing streams.

Of the many attractions which this region possesses during the summer I do not propose at this time to speak; during the winter patients may find here for the greater part of the season bright skies and a dry air. There is a mini-

mum of stormy days, no rain, a complete absence of dust from the middle of November to the middle of April, and almost complete freedom from the troublesome infections of warmer climates, such as influenza, pneumonia, malaria, and typhoid. Elliott writes me that out of 2,000 patients treated in Gravenhurst during a period of ten years he met with only two cases of pneumonia and only one of these was typically lobar.

To the patient coming from more southern scenes the first impression of the bright snow-clad landscape is one of surprise and admiration. He is aware of the cold more by external appearances than by any disagreeable sense of chilliness, and is tempted to doubt the reality of the thermometer's indications. He is distinctly conscious of increased energy, and gazing over the white expanse of frozen lake, surrounded by hills covered with an evergreen forest, he is tempted to renew his boyhood's delight in outdoor sports, under a sun as bright as that of a summer's day, and in an air as pure as Nature can produce it, for its only contamination is the balsamic exhalation from the surrounding pines.

The great depth of snow buries all impurities; any added refuse is quickly hidden and rendered harmless by a fresh snow covering. All noxious emanations lie dormant till the spring, and are then quickly carried off by the rapid flow of water.

The daily variation in winter temperature rarely exceeds 15° F., contrasting favourably with the variation in more southern regions. For in our northern clime the sun's rays though bright, have less direct power, and the white glistening snow neither absorbs nor radiates heat. There is, therefore, not a marked difference between the shade temperature during the day and that of the night.

This moderate variation acts as an effective brace with but little tendency to disturb the system.

For anyone with fair recuperative power, a winter spent in such a region affords the greatest stimulation possible. Its cold, invigorating air and its beautiful scenery energize and enliven, favouring not only perfect nutrition, but also the development of all the system's innate resistant forces, Nature's antibodies, and through them enabling the constitution to make an effective fight against the assault of all pathogenic organisms.

PHYSIOLOGICAL OBSERVATIONS ON PIKE'S PEAK, COLORADO, MADE IN THE SUMMER OF 1911.*

By Professor YANDELL HENDERSON.
NEW HAVEN, CONNECTICUT.

Professor Henderson said that the interest in the physiological effects of the climate of mountains started in the sport of mountaineering rather than in medicine. It was a widely believed fallacy that with a low atmospheric pressure one was subject to severe hæmorrhages. One writer in the last century said that when crossing the Andes the mules breathed hard, his lips bulged, and his eyes burst. This notion that with a low barometric pressure they got severe hæmorrhages was based upon a false idea. Many hundreds of people daily went to Pike's Peak, and ordinary nose bleed was no more common there than occurred among people who took vigorous exercise at sea level. The only cases that he saw of nose bleed were when there was the impact of something against the nose to make it bleed.

A careful study of the arterial blood-pressure was made on many on the Peak, and there was found a slight fall in the arterial blood-pressure. Those who were mountain sick presented a somewhat different condition, but this was another matter. They often gave symptoms of ordinary fainting spells, weak pulse, and other symptoms that went with a cerebral anæmia.

In the seventies of last century Paul Bert showed that the

* By invitation of the Association.

hæmoglobin contained in the red blood cells was increased, and that the ill-effects of a low barometric pressure were due to a lack of oxygen. Some experiments were carried out in steel cylinders from which the air was pumped, and it was found that in pure oxygen patients were as comfortable at one-fifth air pressure as when they were breathing the normal atmospheric air with one-fifth oxygen and four-fifths nitrogen.

Recently he made some observations in New Haven. He got a large boiler, and breathed into it until the oxygen was greatly reduced. When below 10 per cent. he suffered from nystagmus, panting, and almost went into convulsions. There was no great difficulty, in his opinion, in making these studies on artificial "mountain sickness" at the sea-level. It was only a question of oxygen.

A decrease in the amount of carbon dioxide in the blood in the lungs does not occur under low pressure. Zuntz got many results from his investigations, but he was unable to throw much light upon the cause of the condition. Since Paul Bert not much progress had been made in this study. A year and a half ago while in Vienna he met with Haldane and Douglas. They made inquiries where they could find a comfortable mountain on which to make investigations, and where they would not have to suffer many hardships. They did not wish to do anything heroic, and had thought of the Andes or the Himalayas. They finally decided to go to Pike's Peak, Colorado.

The party consisted of Dr. J. S. Haldane and Dr. C. Gordon Douglas, of Oxford, England, Professor E. C. Schneider, of Colorado College, and Professor Henderson. Five weeks were spent on the summit of the Peak. They had apparatus especially for determining the alveolar contents of the lungs; also the respiratory exchange during exercise, the amplitude of respiration, &c. A point of

special interest was to find out the volume of blood in the body.

Another point for investigation was the determination of the possible activity of the lungs at this altitude. One of the problems they wished especially to study was the difficult question as to whether the lungs possessed any active process of secretion, that was, whether the blood in passing through the lungs contained more oxygen than mere diffusion would provide.

After being four or five days at Colorado Springs they had four trains to take them and all the apparatus to the top of Pike's Peak (altitude 14,147 ft.). After being one hour and a half on top they noticed that their lips were blue, and towards evening they began to suffer about the temples. They had headaches. When supper time came they had no appetites. Of course they ate no supper. Their lips were still blue. They were nauseated. They felt like lying down. All this compared in a way to the symptoms caused by sea-sickness, the nausea, the distress about the temples, the frontal headache which was splitting in character, the marked dilatation of the temporal vessels, conditions which pointed to some vascular reaction, and which lasted for four or five days. In summer the railway carried about 200 people up Pike's Peak every day. They stay about an hour. Out of that number twenty or thirty were slightly affected by the altitude. Most of them had nausea and a great deal of headache. Some went into a dead faint when they reached the top. If they tried to climb, they again fainted, and then they would take a train and go down. Some would stay over until the next morning, get up at sunrise, and then vomit; this would occur usually between two and four the next morning. These people would go down and then be all right.

There was another set of people who would come up on

donkeys. It has been said that nobody from the territory west of the Mississippi River can ever go to heaven unless he has climbed Pike's Peak. So they do.

He had seen the floor of the lunch room covered with people, vomiting, some practically unconscious, others who could not take any food. At sunrise, however, they would get up, and some would fall in a faint. He recalled one case in particular—an individual scarcely off the train when the lips became blue, with regurgitation of food and other ill-effects of the high altitude. He was given oxygen, and the lips soon became pink and the individual felt nicely. However, within ten minutes he grabbed a bag of oxygen as if it were a whisky bottle, and ran for his train.

Low air pressure and this lack of oxygen affected people in extraordinary ways; the majority of them were off their heads. He reported several instances of this crazy behaviour.

One of the things noticed at Pike's Peak was that most of those who went up were short-winded, and many of them had Cheyne-Stokes respiration.

Another thing noted was the effect of exercise on the wind. The least work undergone made people out of breath. This was often followed by apnœa. Some experienced terrific spells of dyspnœa and then second wind. After running fifty yards up-hill the legs would wobble. This occurred in one individual in particular, and it became necessary to administer oxygen. He was practically breathless for thirty seconds after the first two or three inhalations.

The problems they wished to study were those related to acclimatization; how can people live at these high altitudes and be comfortable?

The red blood cells were increased from five up to seven millions. The hæmoglobin from 100 per cent. to 135 per cent., 145 per cent., or even higher after

six months' residence. The percentage of hæmoglobin does not remain high after one comes down. Last summer Dr. Henderson had a hæmoglobin percentage himself of from 135 to 140. Now it is normal again. The percentage of lymphocytes was increased.

The most important element in acclimatization to low barometric pressure was the development by the lungs of a capacity to secrete oxygen from the alveolar air into the blood, thus compensating in part for lessened diffusion because of the low oxygen pressure in the atmosphere. The heart-rate is somewhat accelerated even during rest, and greatly accelerated by exercise, but the arterial pressure was not considerably changed. As stated, the hæmorrhages formerly noted are a myth. Respiration is considerably increased even during rest and enormously augmented by even moderate exercise. The red corpuscles are increased 30 per cent. or 40 per cent.; the total volume of blood, however, was unchanged. The CO_2 method was the one used by them. They found what they believed to be clear evidence of pulmonary secretion of oxygen. On Pike's Peak more oxygen was in the blood than in the air. They think they can prove that much of it was secreted from the alveolar air into the blood. They think that the development of this capacity on the part of the lungs to secrete oxygen from the alveolar air into the blood is an important factor in acclimatization. Thus in a new-comer on Pike's Peak the lips are blue, but a day or two later they assume a good colour.

For the discussion of this and the succeeding paper see page 25.

HIGH ALTITUDE AND THE BLOOD.

By W. A. CAMPBELL, M.D.

COLORADO SPRINGS, COLO.

If we feast or fast, if we drink or abstain, if we are hot or cold, if we are asleep or awake, if we rest or take exercise, if we bathe or are massaged, we find that the relative proportions of the constituents of the blood change. Different portions of the same body will vary in blood constituents, and will change when the position of the body is changed, the most dependent portion being the poorer. We see the number of corpuscles, specific gravity and hæmoglobin "worth" vary from day to day, hour to hour. This variation is not limited alone by conditions existing within the body itself or by its immediate surroundings, but changes are noted with varying climatic conditions.

With these rapid changes in one of the component parts of the body the study of the blood has become most interesting and has attracted the attention of the physiologist and scientist for the past half century. Those in the field have differed somewhat in their findings, but as time goes on certain average conditions are becoming established. Like all subjects investigated by delicately devised and intricately constructed instruments, in the use of which errors are prone to occur, and operated by men of varying dexterity in the manipulation of the same, whose judgment of what they find may be somewhat influenced by preconceived opinions, findings have been more or less at variance.

Like many other propositions met with in the past, the effects of these changes were recognized and studied before the cause was known. The ancient Greeks and Arabs recognized changed clinical conditions which we now attribute to variations in the component parts of the blood. They attributed them to physical atmospherical conditions. What these conditions were they were at a loss to know until the discovery of the barometer by Torricelli in 1643, which put the measurement of atmospheric pressure on a scientific basis.

The invention of the balloon by the Montgolfier Brothers in 1783, enabled investigators to make observations at great heights above the earth's surface with a minimum of exertion. The condition of those who made these excursions presented such alarming symptoms that the study of their cause and remedy became interesting.

Dr. Jourdanet, a French physician, practising in Mexico at considerable altitude (6,000 ft.) observed many changes in his *clientèle* from what he had noticed at lower altitudes. He published his observations in 1861. Several of his statements were at variance with the accepted views of his *confrères*. Chief among his statements were those of increased activity in respiration, and intra-organic oxidation and the increased size of the chest in mountain dwellers as compared with the lowlander. Before accepting his findings the Académie de Sciences sent Dr. Coindet to verify their truth. Dr. Coindet's report was also severely criticized. Dr. Jourdanet then provided the eminent French physiologist, Paul Bert, with the necessary means to procure the apparatus to investigate the action of rarefied air on the animal economy by laboratory experiments and investigations. Paul Bert confirmed many of the findings of the previous investigators, and his deductions remain unchanged to-day.

Since Paul Bert gave us his laboratory experiments

much interest has been taken in the study of the blood under varying barometric pressures. To-day it is universally admitted that there are marked changes in the blood in its various component parts due to diminished barometric pressure, the difference among observers being in the extent of these changes, the cause producing the changes and their effects on the animal economy. While laboratory experiments are subject to many discrepancies they are suggestive and form a basis for investigation.

About the close of the year 1889, Viault ascended the mountains of Peru to the town of Morococha, 13,532 ft. elevation, to make observations. Simultaneous with the publication of the preliminary report of his findings, Herrera and Lope presented to the Section of Physiology of the Institute of Medicine in Mexico City their report on the same line of investigation. The findings of these independent workers were practically identical in the number of red blood corpuscles. While the instruments of these earlier workers were not as accurate as those of the present day their findings remain unchanged, and have incited action among other investigators.

We now have tabulated observations compiled from various workers, which show a gradual increase of erythrocytes as we ascend from sea level (Viault, Egger, Solly, Koeppe and Wolf, Lopez, Frankel, Gibbard, Grantz, Mercier, Schroeder, Jaruntowsky, Meischer, Herrera and Lope, and many others). This increase as we ascend, without exertion, is 50,000 corpuscles per cu. mm. of blood per thousand feet.

The latest investigations along this line, that we are cognizant of, are those made on Pike's Peak during the summer of 1911 by Messrs. Haldane, Douglas, Henderson, and Schneider. A report of their deductions, presented to the Royal Society, London, on January 18, 1912, by Dr.

J. S. Haldane, embraces general observations of the tourists who ascended the Peak during their stay, their own condition during acclimatization and tests of the various constituents of their blood. Their findings are worthy of the most careful consideration as they were obtained by men of ability, under the most advantageous surroundings, with the most up-to-date instruments. The summit of Pike's Peak offers admirable advantages for the study of the blood at a high altitude. It has an elevation of 14,109 ft. above sea-level. The barometric pressure is about 18 inches (457 mm.). It is reached, without exertion, by cog road trains. Accommodation for staying on the Peak is very good.

In presenting a synopsis of their work Dr. Haldane states that "The main object of the expedition was to discover to what extent, and by what means, adaptation takes place to low barometric pressure and consequent deficiency in the partial pressure of oxygen in the air."

In regard to the erythrocytes they found an increase of 20 per cent. to 25 per cent. in those from the sea-level and 20 per cent. in the subject from Colorado Springs who had recently returned from a low altitude. These percentages plainly show that all experienced a decided increase in the erythrocytes. When the results of their work are put upon a chart we note that the erythrocytes increased noticeably for first forty-eight hours, then diminished for a time, and afterwards made a gradual ascent and remained up during their stay on the Peak. We regret that no counts were made immediately on arrival on the summit of the Peak. We are inclined to believe they would have been higher than on the second day. In a paper presented to this Society in 1901 (Campbell and Hoagland) we sought to show that there was a marked increase in the erythrocyte count on arrival on the summit of the Peak, without exertion, which was of a transient character. This rise we considered separate and dis-

tinct from the permanent rise, and disappears at once on return to the lower altitude without any evidences of destruction of the red corpuscles, *viz.*, hæmoglobinuria, icterus, and bilirubinuria.

Our experiments showed a marked increase in the erythrocyte count, and our subjects were not on the Peak more than thirty minutes. At that time, and we have no reason to change our opinion, we accounted for the rapid increase by the dilatation of the peripheral capillaries and the want of force in the heart's action which produced a capillary stasis. In other words, the diminished barometric pressure with its concomitant, the want of oxygen, acted as a vaso-motor dilator. It is interesting to compare the conditions found in those arriving on the Peak—*viz.*, blueness of the lips and face, nausea, intestinal disturbances, headache, fainting in some persons, periodic breathing, constriction of the chest in cardiac region, hyperpnœa, rapid cardiac action, and lessened arterial pressure—with those produced by a full therapeutic dose of that most powerful vaso-motor dilator, nitroglycerine.

The demonstration of the permanent or stable increase in the erythrocytes at high altitudes is another confirmation of an almost universal opinion that such is the case. These recent investigators show that the volume of blood corpuscles actually increases by a stay on the Peak, from 15 per cent. to 21 per cent. This is a valuable discovery, and one that daily clinical observations will confirm.

The cause of the increase in the red blood corpuscles is a subject that has engaged the attention of many scientists in the past. At first physiologists were inclined to believe that the increased count was due to errors in the instrument used, the Thoma-Zeiss hæmocytometer (Gottstein, Meissen, Schroeder). Later investigations with corrected counting chambers confirm the findings of the Thoma-Zeiss instru-

ment, but on a slightly lower scale (Pacht, Oliver, and others). The erythrocytes are increased in laboratory experiments by lowered pressure (Sellior, Jaruntowsky, Schroeder). They are increased by rest and sleep (Oliver). Eating and the taking of food decreases them. Oliver found them perceptively increased in the dry warm climate of Helouan, Egypt. Weinzirl thinks the cold of mountain regions causes the increase. Others think the inspissation theory accounts for the rise (Graivitz). Others that diminished barometric pressure causes a different distribution of the corpuscles and plasma (Cohnstein and Zuntz). Light and other elements characteristic of high altitudes are given as factors (Mosso). Dr. Laake has advanced radio-activity as a cause, finding this force in the air of Arosa three to five times greater than on the plains. These various theories all have sufficient basis to make them worthy of consideration, and, undoubtedly, they are factors in the cause of increased chromocytes, even though we do not consider them the chief factor. It has remained for the recent investigators to demonstrate to us with mathematical precision that the chief factor in the permanent rise is diminished barometric pressure and the lessened oxygen, incident thereto, as we ascend to high altitudes. Further, that the adaptation to the high altitude is mainly accomplished through the "increased secretory activity of the alveolar epithelium."

The hæmoglobin, like the corpuscles, varies greatly under diverse or changed surroundings. There has been observed a night and morning variation in London of 8.5 points and a hæmoglobin value of 0.06; at Davos 4.2 points and value of 0.02 (Oliver). Exercise lessens the relative amount of hæmoglobin in corpuscles and diminishes "worth" of corpuscles (Oliver). It has been observed that the hæmoglobin, proportionate to corpuscles, first fell and afterwards rose in high altitude (Wolfe and Koeppe,

Jaruntowsky and Schroeder). In the recent investigations "the percentage of hæmoglobin in the blood increased for several weeks," . . . . . "corresponding to an oxygen capacity of from 21 to 28.5 c.c. of oxygen per 100 c.c. of blood." This finding in oxygen capacity is very close to that of other observers (Bert, Viault, Muntz, Egger, Lopez, Frankel, Gibbard, Grantz, Herrera and Lope) in high altitudes and also to laboratory experiments (Regnard).

Of no less importance to the clinician and health seeker is the strong confirmation that the leucocytes are as markedly increased as the chromocytes and hæmoglobin. Their line, when charted, is not as continuous as that of the chromocytes, but their permanency is readily apparent. These findings confirm those of local investigators (Webb, Williams, Gilbert, and others). With the modern understanding of the *rôle* the leucocytes play in the cure of many of our infectious diseases the importance of their increase is patent.

Aside from the study of the blood at high altitudes we wish to speak of one observation of Dr. Haldane. The statement that "the respiratory exchange during rest remained normal" and "the respiratory exchange during work did not appear to be markedly increased" was rather a surprise to us. We, who have noted the enlargement of the thorax of those who have been under our observation, have clinically formed the opinion that the chest does enlarge and that the respiratory exchange is increased. We have felt satisfied that the residual air is greater, the reserve air is greater, and the tidal air is increased. The complemental air would be what the subject cared to make it, being controlled by the will of the individual. We will cite one illustration. In 1905 we examined for life insurance a man who a short time before had come from a low altitude in the east. His chest measurement over the fourth rib was then 37 in. and the respiratory sounds diminished over the

apices. In 1909 we examined him again, and his measurement was 38 in. and apices expanding. To-day we examined him for the third time, and find chest measurement 39 in. with no evidences of former limited respiratory sounds. It is this clinical evidence that is so convincing to physicians resident in high altitudes. In the increased respiratory exchange we have the chief factor in the production of greater chest development in high altitudes. Other investigators have observed that rarefied air causes increase in depth of inspiration, hence increased respiratory capacity (Mosso, Von Viveunt, De Saussure, Solly). From a paper read before this Society in 1903 by Dr. C. F. Gardiner (Gardiner and Hoagland) we quote the following: "Our results, as shown by the charts, corroborate the popular idea of an increase of chest measurements at 6,000 ft. altitude in individuals born and living at such altitude." Again, in this increased respiratory exchange, we have the means of bringing to the alveoli the oxygen to be secreted by the alveolar epithelium.

Closely allied to the study of the blood is the consideration of the vessels that contain it. That altitude increases the heart's action is generally conceded (De Saussure, M. Lorlit, Mermid, Mosso, Herrera and Lope, Schneider and Hedblom, Campbell and Hoagland, and many others). During our residence in Colorado Springs, 6,000 ft. altitude, we have made 1,600 life insurance examinations of which we have records. We would rate those making application as an average class of individuals as to health. We find the average pulse-rate of these people to be 75, which is perceptibly higher than at sea-level. In our clinical experience, in the normal person, we find the heart increased in strength and capacity, a state of physiological cardiac hypertrophy (Solly, Oertel) after acclimatization, and continues during life in this altitude.

The older writers on the subject of blood-pressure spoke of the condition as one of arterial tension. Different findings have been noted as to the blood-pressure of high altitudes or diminished barometric pressure. There are those who state that the tension was raised (Freidlander and Herler, Gorbatschew, Oliver), others that it was unaffected (Frankel and Geppert, Mosso), and still others that the tension was lowered (Paul Bert, Lortet, Conway, Herrera and Lope, Gardiner and Hoagland, Schneider and Hedblom). Owing to the many physical and psychical conditions that influence blood-pressure it is difficult to establish a definite fixed point for any altitude. From experiments by responsible men (Gardiner and Hoagland, Schneider and Hedblom) we are inclined to believe the blood-pressure of subjects in Colorado Springs, 6,000 ft. altitude, is 5 mm. less than at sea-level; and that on the summit of Pike's Peak, 14,109 ft., it is 5 mm. to 7 mm. less than at Colorado Springs.

Our review of the subject leads us to the following conclusions:—

(1) The study of the blood has been a difficult one, subject to many corrections, owing to the variation in its component parts in the daily walks of life.

(2) The study of the blood changes at high altitudes is attended by many additional intricate problems owing to the changed climatic environments and the inaccessibility of places of observation.

(3) Altitudes increase the erythrocytes, hæmoglobin and leucocytes, thereby furnishing three of the most important factors in the building up of a stronger resistance against the infectious diseases.

(4) The heart acts faster and the pressure is lower, which tends to strengthen the cardiac muscles just as exercise of the general muscular system strengthens the individual as

a whole. Caution must be enjoined in the beginning that the muscles be not overworked.

(5) The lack of oxygen and the consequent increased respiratory exchange causes a more rapid metamorphosis of tissue thereby aiding materially in the throwing off of morbid processes. The same condition prevents stagnation of secretions and brings into action portions of the lung unused at lower altitudes.

(6) A study of blood conditions at high altitudes ought to convince any unprejudiced, financially uninterested individual that altitude is not a fake. And, by the application of the knowledge gained in its study, many clinical cases can be selected that will be materially benefited by a change to a high altitude.

DISCUSSION.

Dr. JUDSON DALAND (Philadelphia, Pa.) said that the Association had been interested in these questions for many years, and he recalled a most interesting paper that was given them by Dr. Babcock, and also one of great interest that was given them by the dearly beloved Dr. Solly. Dr. Daland could recall many conversations upon this subject in July of 1899 when he decided to make some experiments. The experiment was in ascending Pike's Peak and remaining there four hours. It was interesting to note that Dr. Solly suffered no discomfort from dyspnœa or cyanosis. Dr. Daland, however, had cyanosis of the lips. Dr. Daland sat still while Dr. Solly walked about freely and easily, and he showed no particular distress whatever. There was no change in the readings of the hæmatocrite.

On July 15, at 9.15 a.m., the percentage of hæmoglobin was 96. On the following day, July 16, at 9.30 a.m. his pulse was 72 and respirations 18; at noon the pulse was 72 and respirations 20. After slight exercise both pulse and respiration were accelerated, but soon returned to normal after resting. No especially bad effects were noted for the period of time mentioned. Observations on Pike's Peak showed the volume percentage to be 92. Microscopically it was shown that the number of red corpuscles was increased, not changed morphologically, but the blood was slightly paler. There was no apparent leucocytosis. Dr. Daland attempted to make blood counts but failed, because of lack of time, because the blood-cells were not

in the field, and because he had a terrific headache. He had to return to Colorado Springs.

With regard to slight changes in the readings of the hæmatometer, any variation of five per cent. he considered slight; it must be greater than that.

The observations Dr. Daland made upon himself. He found that the blood coagulated rapidly and was of normal colour. At 9.30 the volume was 70.14, hæmoglobin 96, and pulse 80. At Pike's Peak the pulse was 73, respirations 34, volume from 94 to 99, and colouring matter 92. The intense headache from which he suffered disappeared when he arrived at Colorado Springs. He had no nausea nor vomiting.

He drew into his work two waiters, brothers. One was 20 years of age, and weighed 209 lb., and was 5 ft. 8 in. in height. He had been a resident at the Peak since June 20, and previously had been a resident at Manitou. His volume per cent. was 102; hæmoglobin 115; no leucocytosis; blood-cells not counted. He was sufficiently strong to carry a child one and a half miles up the mountain. Therefore he had become accustomed to the altitude.

The other man, his brother, was 29 years of age, and had been a resident there since May, 1899, and had previously been a resident at Manitou. His volume was 104; hæmoglobin 110. The microscopical examination revealed nothing important. There was no manifest leucocytosis.

The contribution presented by Professor Henderson was very interesting to Dr. Daland, and it brought out two important points. First it demonstrated absolutely the value of physiological functioning on the part of the alveolar cells to secrete oxygen; secondly the observations made regarding leucocytosis, really a lymphocytosis. When one went to an altitude of more than 20,000 ft. one experienced a most remarkable and extraordinary air hunger.

Dr. HOAGLAND (Colorado Springs, Colo.) spoke of the great importance of Professor Henderson's paper, especially to the men living in Colorado. The physicians out there were beginning to stand for a principle, which was that the effect of altitude was not altogether deleterious, and if a patient went to Colorado it was not necessary that he should die!

There were many points that he would like to discuss, but would only touch upon one or two.

First, in regard to the heart, some ten or eleven years ago, when he was experimenting with the blood upon Pike's Peak, he had occasion to ascend every day for six weeks in the fall, and six weeks in the spring, and saw a great many people on the train who time and again, when their attention was called to the train being at timber line, would begin at once to turn pale and feel their pulse; on diverting their attention he had seen the colour return to their faces in a few minutes, and these same individuals, on arriving at the summit, would walk around and eat sandwiches!

He saw many people from the east at Colorado Springs with valvular heart disease. Dr. Solly had a mitral lesion. In his opinion altitude helps many cases of simple weakened heart muscle. When there was a degenerate heart muscle altitude was contra-indicated.

Second, he thought there was a wrong impression among the physicians throughout the country in regard to the mortality from pneumonia among those who lived at a high altitude. This impression is also common among the natives. He well remembers the first case of pneumonia he treated; at his first visit he did not know whether to send the patient immediately lower or to send for the undertaker! To his surprise the patient recovered. On finding in his own practice that pneumonia was apparently no more fatal there than elsewhere, and in order to make comparisons, he collected statistics from hospitals situated at high altitudes, such as Denver, Colorado Springs, Leadville, Cripple Creek and Pueblo, and commenced to compare these with those of the Massachusetts General and the Philadelphia hospitals, and he found the mortality was no higher.

There was one point that he had noticed which had not been mentioned, which was that the attendants who stayed on the Peak during the summer often had attacks of insomnia, lasting three or four days.

He agreed with Dr. Campbell that there was an increase in the capacity of the chest of those living at high altitudes, and cited himself as an example.

When he went to Colorado fourteen years ago a great many cases of tuberculosis were being sent to the State; he had lived to see the time when the pendulum had swung the other way, and cases of tuberculosis were kept at home to be cured. He felt confident that he would live to see the pendulum again swing back, and properly selected cases would be sent to the high dry plateau on the eastern slope of the Rocky Mountains for the cure of tuberculosis.

Dr. CHARLES FOX GARDINER (Colorado Springs, Colo.): Many strange facts are sometimes noted regarding the effects of altitude, and twenty-five years ago I was in charge of fifty men working in a silver mine at an altitude of 13,500 ft. Pneumonia was fairly frequent among the miners, and when a case occurred I would at once wrap him in blankets, tie him on an improvised sled made of snow-shoes, and have him dragged over the snow-field to a town of 9,000 ft. altitude. Almost invariably this produced a prompt improvement in the patient's condition. The breathing, colour, pulse, and respiration would almost at once tend to become more nearly normal as I lowered such patients some 4,000 or 5,000 ft. On the other hand, at an altitude of 6,000 ft. I have frequently taken patients with pneumonia 3,000 or 4,000 ft. lower hoping for a like improvement and have invariably been disappointed. There seems to be a limit of tolerance established at about 10,000 ft., and this has

been indicated in Dr. Henderson's paper. Also, in regard to mountain sickness, the irregular effect of altitudes is very markedly shown. For some two years I experimented upon a very strong, healthy individual, who was 6 ft. high, and weighed about 190 lb. He was employed by the signal service, his duty being to ascend Pike's Peak twice per week. This was before the days of the railway, and necessitated considerable exertion, partly on mule back and partly afoot. This man was invariably attacked by mountain sickness, and when he arrived at the house on the summit was unable to make his observation, being obliged to lie down and having persistent vomiting and weakness. By giving this man two grains of calomel on the day preceding his ascent all symptoms of mountain sickness disappeared, and he made the trip in comfort. When he neglected this precaution he was violently ill. This was not due to suggestion, as sugar of milk tablets given with the belief they were calomel did not protect him the least. Also, in my own case, having lived continuously for thirty years between 6,000 and 9,000 ft., I have twice been attacked by acute mountain sickness upon my return from a brief visit to sea-level, while at other times on my return to 6,000 ft. have suffered no ill-effects whatever.

In no condition is the effect of altitude more irregular and difficult to understand than in some forms of heart disease. I remember one case in particular in which all the valves were affected most disastrously, and in which the colour, dyspnœa, and swelling were marked features, occurring in a subject who lived for twenty-five years at an altitude of 7,000 ft. This man was sent lower, to Philadelphia, with hopes of benefit; he was seen by several noted specialists, who cautioned him against ever going higher again. After eighteen months spent at sea-level there was no relief at all; he returned to the mountains, where he lived on a ranch at 8,500 ft. altitude, and was in better health than he had been for years. He was able to chop wood and perform considerable manual labour. I have had, in addition to this, three or four other cases in which there was marked myocardial weakness, who, when sent to sea-level, did not improve, but who improved markedly at 6,000 ft. on their return. These hasty references are merely meant to emphasize the fact that there are exceptions to all laws, and that it does not do to theorize unless one is on the ground and able to study these altitude effects at first hand for a number of years.

Dr. DE LANCEY ROCHESTER (Buffalo, N.Y.) said there was an increase in the percentage of hæmoglobin, in the number of red cells, and in the number of white cells. At the same time there is a dilatation of the peripheral capillaries. Was there, however, a real increase in the hæmoglobin, red and white cells? Was there not what might result from the dilatation of the capillaries? Dr. Campbell had stated that there was an increase in the lymphocytes in order to

antagonize infection. Dr. Rochester asked whether the lymphocytes antagonized infection. He thought that that property belonged rather to the polymorphonuclear leucocytes, as they are phagocytic.

Dr. F. M. POTTENGER (Monrovia, Cal.) said that care should be exercised that wrong conclusions are not drawn from these physiological inquiries. The important physiological point was that as we ascend mountains and go higher and higher there are certain definite changes which occur in the blood; an increase in the red cells, an increase in the hæmoglobin, and an increase in white cells have all been pointed out. The fact that these return to normal as soon as the patient returns to sea-level shows that they are purely physiological, and a part of the physiological adaptation which occurs when one changes levels. It means that certain physiological changes are necessary to maintain an equilibrium when differences in altitude are encountered. He said that he practised at low level, and at times sent patients to higher altitudes and had seen improvement occur. He also received many patients from higher levels, and had seen improvement occur when they had come to the low levels. The question is not one between high and low altitude men, but it is a question of interpreting the physiological laws correctly and not drawing therapeutic conclusions from observations which do not warrant them. The new fact which Dr. Henderson's observation seemed to establish is, that after a certain elevation has been reached the organism, in order to adapt itself to the changed conditions, secretes oxygen from the alveoli.

Dr. W. A. CAMPBELL (Colorado Springs, Colo.), in closing his part of the discussion, said that he did not speak of lymphocytes, but leucocytes, in his paper. It was the polymorphonuclear leucocytes which were desired to combat disease.

With regard to Dr. Pottenger's statement that the changes noted in the blood were physiological in character, he granted it. If the physiological changes were advantageous to the diseased individual, why not get them from altitude as well as from medication? Many times the former is the more agreeable to take.

All Nature is lavish in her supplies. At the sea-level the full working capacity of many organs is not needed to maintain good health. Notable in this respect is the capacity of the respiratory and circulatory system. There is a point in altitude where the full capacity is required and still a higher altitude where they are required to do extra work. At Colorado Springs, which is a medium altitude of 6,000 ft., we think the proper equilibrium is attained and the organs are not overworked in the healthy or normal individual. Some people who go there may complain of tachycardia and dyspnœa, and their fears are not allayed until equilibrium in the respiratory and circulatory organs is established.

In relation to mountain sickness, he asked Mr. Heistand, who

runs the house on the top of Pike's Peak, regarding it. He said that sometimes he suffered from it and sometimes he did not. His remedy was bromo-seltzer.

Dr. A. J. RICHER (Ste. Agatha des Monts, Province of Quebec) said that there was no doubt but that the change was due to the struggle for adaptation. When at a high altitude involuntarily we inflict a something upon the patient—extra exertion for aeration purposes. It is the struggle for adaptation or compensation.

Dr. CARROLL E. EDSON (Denver, Colo.) said that when a splitting headache occurred they should remember that frequently it was bilateral, and it would be interesting to know whether any of the cases of frontal headache, or bilateral headache, were due to an unrecognized collection in the frontal sinus. It was difficult to state that this was purely a circulatory phenomenon. Many patients did not have it, and many did.

Dr. W. A. JAYNE (Denver, Colo.) said that the study of the condition of the blood at high altitudes was very interesting to him, and especially because he went to Colorado before the blood could be studied in a scientific manner. The observations made showing an increase in the constituents of the blood explained many things, but they were unable to prove anything clinically until very recently. One observation made shortly after he went to Colorado he was not prepared for.

In the early 'eighties he went to Colorado on account of his health. Shortly afterwards he began to practise medicine at an altitude between 9,000 and 11,000 ft. He heard on every hand gossip of the injurious effects of high altitude. To his surprise he found that surgical wounds healed quickly, a large proportion by first intention. Fractures united promptly. Such success in acute surgery was greater than he was accustomed to see in New York City. Good and quick recoveries were noted in dealing with all acute diseases. The above were a few clinical observations that were made by him, such observations as he was not prepared for, and had never even heard of results. His subsequent experience confirmed what they now explained on purely physiological grounds.

He saw many cases of pneumonia at the mining camps, and was surprised to note that this disease was not more fatal than at other altitudes under like conditions, but for reasons: The men were away from their old conventional surroundings, they were unrestrained, often of bad morals, and had "adjourned the ordinary standards of their lives" similar to those spoken of by Governor Wilson in his address at Atlantic City. Possibly after a period of intoxication they developed pneumonia on the mountain sides and were immediately taken from their cabins, perhaps with the weather at zero, and carried ten or fifteen miles to the hospital, where they often died

promptly with pulmonary œdema. Under proper conditions they should have recovered in same proportion as at lower altitudes

In discussion of Dr. Campbell's paper Dr. BABCOCK (Chicago, Ill.), said: I do not feel that I can add anything of value to the discussion already had, because I do not know anything positive in regard to the effect of altitude in cases of heart disease. Whenever a person with or without signs of heart disease asks me what will be the effect in his case of an altitude of 6,000 or 8,000 ft., I tell him I cannot say positively what the effect will be. I have known a patient with a valvular lesion to endure the altitude of Leadville, Colo., or other places of high altitude, without apparent ill results. So that when I am asked if it will be safe for a cardiopath to go to Colorado I generally reply, "Yes, provided you remain quiet until you become accustomed to the altitude," for it does not appear to be the height *per se* that injures the heart so much as it is exertion in such a rarefied air, and hence the individual must lie down and keep at rest until he becomes acclimatized as it were. I usually add, also, that in going to a high altitude the person must go with full knowledge of the uncertainty of the effects in his case. Dyspnœa and tachycardia are an indication for absolute rest, and after a few days one is likely to become accustomed to the altitude, but if not, he should not remain.

DISCUSSION.

Professor YANDELL HENDERSON (New Haven, Conn.), closing his part of the discussion, said in answer to Dr. Edson's question about bilateral headaches being due to sinus trouble, he did not think so. It happened that the blood-vessels or arteries were congested on one side and not on the other. Since what he said about the secretion of oxygen and the method of it did not seem to be clear, he used the black-board to demonstrate.

They had no poker insomnia. The critical line was about 6,000 to 8,000 feet. There should be an adjustment of climate to the conditions mentioned. At 6,000 feet oxygen secretion was not necessary. It appeared to be clear that at Colorado Springs there would be no more secretion of oxygen to aerate the blood than at Hartford. But in going up Pike's Peak secretion of oxygen would occur. He reported the case of a college boy who was unduly affected. He had bilateral headaches, became blue, and was generally miserable. It was found that he was not secreting oxygen. Two or three days later he began to secrete oxygen to his immense relief. At Cripple Creek (9,000 feet) oxygen secretion was necessary and kept them from being mountain sick.

With regard to the work on the lymphocytes, that was not theirs, but Dr. Webb's. He was responsible for the idea of increase in the lymphocytes as being an important factor in combating tuberculosis. The credit should go to Dr. Webb.

He said the discrepancy regarding the respiratory exchange was only apparent and not real. No more CO_2 was got rid of at high altitudes than below, nor was the intake of oxygen greater; but in getting rid of it the patient breathed harder. To get rid of 25 c.c. CO_2, instead of breathing 500 c.c. tidal air, it required 700 c.c. tidal air.

Similar observations had been made by Professor Bingham, who climbed 6,000 or 7,000 feet higher than Pike's Peak, taking him six or seven days to go up. He would walk twenty steps and then lie down a few minutes. He managed to get to the top. He said the highest altitude ever reached was by the Duke of the Abruzzi in the Himalayas, 24,000 ft. While there a snowstorm came on and they had to come down. At 24,000 ft. the barometric pressure was very low, too low for the mere diffusion of oxygen through the lungs to support life. Secretion would be absolutely necessary.

CLIMATOLOGY AS PRACTISED BY HIPPOCRATES.*

By Dr. DE LANCEY ROCHESTER.
BUFFALO, N.Y.

There were many Asclepia or Temples of Health in Greece. Most of them were erected in the neighbourhood of some medicinal spring. They were really sanitaria. Especially noted among them were two: one at Cnidos and one at Cos. To these temples patients came in goodly numbers. "At his entrance into the temple, the devotee was subjected to purifications and made to go through a regular course of bathing and massage . . . fomentations with decoctions of odoriferous herbs were also used. A total abstinence from food was at first prescribed, though later foods of various kinds were allowed."

Every means that could be thought of was used for working upon the imagination of the sick, such as religious ceremonies of an imposing nature, accompanied by music, and whatever else could arouse their senses, conciliate their confidence, and in certain cases contribute to their amusement. The Asclepiadæ noted down with great care the modes of onset and clinical course with symptoms and modes of termination of the several cases that came under their care. "From his forefathers Hippocrates inherited a dis-

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* My information in regard to Hippocrates has been culled from many sources, though most of it has come from the translation of Hippocrates' work by Francis Adams, and from the copious notes which he gives in connection with this translation.

tinguished situation in one of the most eminent hospitals, or temples of health, then in existence, the Asclepion of Cos, where he must have enjoyed full access to all the treasures of observations, collected during many generations, and at the same time would have an opportunity of assisting his own father in the management of the sick. Thus from his youth he must have been familiar with the principles of medicine, both in the abstract and in the concrete. In addition to all this he had excellent opportunities of estimating the good and bad effects resulting from the application of gymnastic exercises in the cure of diseases, under the tuition of Herodicus, the first person who is known for certain to have cultivated this art as a branch of medicine. He was further instructed in the polite literature and philosophy of the age by two men of classical celebrity, Gorgias and Democritus, the latter of whom is well known to have devoted much attention to the study of medicine and its cognate sciences, comparative anatomy and physiology."

Hippocrates began his practice, as his father and forefathers had, in the Asclepion of Cos. His reputation, however, became so great as a physician that he visited, practised medicine and taught its principle in many places. It is certain that he thus visited Thrace, Delos, Thessaly and Athens, and that in all probability he was called upon to attend the King of Macedonia. He certainly visited Pella and Acanthus and some other places in Macedonia.

He also spent some time at Abdera, where he made very careful studies of fevers.

So far as known he is the first physician who wrote and published works on subjects connected with health and disease. In the Asclepia, especially those of Cnidos and Cos, were records of probably all cases who had come for treatment. These records Hippocrates evidently studied

diligently. To the careful study of these records, to the careful recording and study of his own cases, and to the intelligent interpretation of the observations thus collected, is due the value of the "Works of Hippocrates."

At the Asclepion of Cnidos, the subjective symptoms, the relation of these symptoms to individual parts of the body and the use of active remedies, especially drastics, are said to have received especial attention. "The school of Cos, in contrast to that of Cnidos, cultivated especially objective investigations and the relation of the symptoms to the entire individual. They cultivated also etiology and particularly prognosis. In treatment they trusted much to the *vis medicatrix naturæ*, were careful in their use of powerful drugs and drastic procedures, though not hesitating to have recourse to bleeding when deemed necessary."

Dietetics was one of their strong points. In fact, this school seems to have been far ahead of any of its contemporaries in the practice of scientific medicine. It was in this school that Hippocrates received most of his medical training, though it shows the breadth of his mind and his truly scientific spirit that after leaving Cos he also went to Cnidos to study, thus culling the best that the world at that time could give.

Among the genuine works of Hippocrates the Great is one book on "Airs, Waters and Places."

Such a title immediately suggests climatology. In the introduction to this work he says: "Whoever wishes to investigate medicine properly should proceed thus: In the first place to consider the seasons of the year, and what effects each of them produces (for they are not at all alike, but differ much from themselves in regard to their changes). Then the winds, the hot and the cold, especially such as are common to all countries, and then such as are peculiar to each locality. We must also consider the qualities of

the waters, for as they differ from one another in taste and weight, so also do they differ much in their qualities. In the same manner, when one comes into a city to which he is a stranger, he ought to consider its situation, how it lies as to the winds and the rising of the sun; for its influence is not the same whether it lies to the north or the south, to the rising or to the setting sun. These things one ought to consider most attentively, and concerning the waters which the inhabitants use, whether they be marshy and soft, or hard, and running from elevated and rocky situations, and then if saltish and unfit for cooking; and the ground, whether it be naked and deficient in water, or wooded and well watered, and whether it lies in a hollow, confined situation, or is elevated and cold; and the mode in which the inhabitants live, and what are their pursuits, whether they are fond of drinking and eating to excess, and given to indolence, or are fond of exercise and labour, and not given to excess in eating and drinking.

"From these things he must proceed to investigate everything else. For if one knows all things well, or at least the greater part of them, he cannot miss knowing, when he comes into a strange city, either the diseases peculiar to the place, or the particular nature of common diseases, so that he will not be in doubt as to the treatment of the diseases, or that he will not commit mistakes, as is likely to be the case provided one had not previously considered these matters.

"A city that is exposed to hot winds (these are between the wintry rising, and the wintry setting of the sun), and to which these are peculiar, but which is sheltered from the north winds; in such a city the waters will be plenteous and saltish, and as they run from an elevated source, they are necessarily hot in summer and cold in winter; the heads of the inhabitants are of a humid and pituitous con-

stitution, and their bellies subject to frequent disorders, owing to the phlegm running down from the head; the forms of their bodies, for the most part, are rather flabby; they do not eat nor drink much; drinking wine in particular, and more especially if carried to intoxication, is oppressive to them; and the following diseases are peculiar to the district: in the first place, the women are sickly and subject to excessive menstruation; then many are unfruitful from disease, and not from nature, and they have frequent miscarriages; infants are subject to attacks of convulsions and asthma, which they consider to be connected with infancy, and hold to be a sacred disease. The men are subject to attacks of dysentery, diarrhœa, hepialus, chronic fevers in winter, of epinyctis, frequently, and of hæmorrhoids about the anus. Pleurisies, peripneumonies, ardent fevers, and whatever diseases are reckoned acute, do not often occur, for such diseases are not apt to prevail where the bowels are loose. Ophthalmies occur of a humid character, but not of a serious nature, and of short duration, unless they attack epidemically from the change of the seasons. And when they pass their fiftieth year, defluxions supervening from the brain render them paralytic when exposed suddenly to strokes of the sun, or to cold. These diseases are endemic to them, and, moreover, if any epidemic disease connected with the change of the seasons prevail they are also liable to it.

"But the following is the condition of cities which have the opposite exposure, namely, to cold winds, between the summer settings and the summer risings of the sun, and to which these winds are peculiar, and which are sheltered from the south and the hot breezes. In the first place the waters are, for the most part, hard and cold. The men must necessarily be well braced and slender, and they must have the discharges downwards of the alimentary canal

hard, and of difficult evacuation, while those upwards are more fluid, and rather bilious than pituitous. Their heads are sound and hard, and they are liable to burstings for the most part. The diseases which prevail epidemically with them are pleurisies, and those which are called acute diseases. This must be the case when the bowels are bound; and from any causes many become affected with suppurations in the lungs, the cause of which is the tension of the body and hardness of the bowels; for their dryness and the coldness of the water dispose them to rupture. Such constitutions must be given to excess of eating, but not of drinking; for it is not possible to be gourmands and drunkards at the same time. Ophthalmies, too, at length supervene; these being of a hard and violent nature, and soon ending in rupture of the eyes; persons under 30 years of age are liable to severe bleedings at the nose in summer; attacks of epilepsy are rare but severe. Such people are likely to be rather long lived; their ulcers are not attended by serous discharges, nor of a malignant character; in disposition they are rather ferocious than gentle. The diseases I have mentioned are peculiar to men, and besides they are liable to any common complaint which may be prevailing from the changes of the seasons. But the women, in the first place, are of a hard constitution, from the waters being hard, indigestible, and cold; and their menstrual discharges are not regular, but in small quantity, and painful. Then they have difficult parturition, but they are not very subject to abortions. And when they do bring forth children, they are unable to nurse them; for the hardness and indigestible nature of the water puts away their milk. Phthisis frequently supervenes after childbirth, for the efforts of it frequently bring on ruptures and strains. Children, while still little, are subject to dropsies in the testicle, which dis-

appear as they grow older; in such a town they are late in attaining manhood. It is, as I have now stated, with regard to the hot and cold winds and cities thus exposed.

"Cities that are exposed to winds between the summer and the winter risings of the sun, and those the opposite to them, have the following characters: Those which lie to the rising of the sun are all likely to be more healthy than such as are turned to the north, or those exposed to the hot winds, even if there should not be a furlong between them. In the first place, both the heat and the cold are more moderate. Then such waters as flow to the rising sun must necessarily be clear, fragrant, soft, and delightful to drink, in such a city. For the sun in rising and shining upon purifies them, by dispelling the vapours which generally prevail in the morning. The persons of the inhabitants are, for the most part, well coloured and blooming, unless some disease counteract. The inhabitants have clear voices, and in temper and intellect are superior to those which are exposed to the north, and all productions of the country in like manner are better. A city so situated resembles the spring as to moderation between heat and cold, and the diseases are few in number, and of a feeble kind, and bear a resemblance to the diseases which prevail in regions exposed to hot winds. The women there are very prolific, and have easy deliveries. Thus it is with regard to them.

"But such cities as lie to the west, and which are sheltered from winds blowing from the east, and which the hot winds and the cold winds of the north scarcely touch, must necessarily be in a very unhealthy situation: in the first place, the waters are not clear, the cause of which is, because the mist prevails commonly in the morning, and it is mixed up with the water and destroys its clearness, for the sun does not shine upon the water until he be considerably raised above the horizon. And in summer, cold breezes

from the east blow and dews fall; and in the latter part of the day the setting sun particularly scorches the inhabitants, and therefore they are pale and enfeebled, and are partly subject to all the aforesaid diseases, but no one is peculiar to them. Their voices are rough and hoarse owing to the state of the air, which in such a situation is generally impure and unwholesome, for they have not the northern winds to purify it; and these winds they have are of a very humid character, such being the nature of the evening breezes. Such a situation of a city bears a great resemblance to autumn as regards the changes of the day, inasmuch as the difference between morning and evening is great. So it is with regard to the winds that are conductive to health, or the contrary."

It is interesting to note also his observations in regard to waters of various kinds: "I wish to give an account of the several kinds of waters, namely, of such as are wholesome, and what bad and what good effects may be derived from water; for water contributes much toward health. Such waters then as are marshy, stagnant, and belong to the lakes, are necessarily hot in summer, thick, and have a strong smell, since they have no current; but being constantly supplied by rain-water, and the sun heating them, they necessarily want their proper colour, are unwholesome and form bile; in winter, they become congealed, cold, and muddy with snow and ice, so that they are most apt to engender phlegm, and bring on hoarseness; those who drink them have large and obstructed spleens, their bellies are hard, emaciated, and hot; and their shoulders, collar-bones, and faces emaciated; for their flesh is melted down and taken up by the spleen, and hence they are slender; such persons then are voracious and thirsty; their bellies are very dry, both above and below, so that they require the strongest medicines. This disease is habitual to them both

in summer and in winter, and in addition they are very subject to dropsies of a most fatal character; and in summer dysenteries, diarrhœas, and protracted quartan fevers frequently seize them, and these diseases when prolonged dispose such constitutions to dropsies, and thus prove fatal. These are the diseases which attack them in summer; but in winter younger persons are liable to pneumonia, and maniacal affections; and older persons to ardent fevers, from hardness of the belly. Women are subject to œdema and leucophlegmasiæ, when pregnant they have difficult deliveries; their infants are large and swelled, and then during nursing they become wasted and sickly, and the lochial discharge after parturition does not proceed properly with the women. The children are particularly subject to hernia, and adults to varices and ulcers on their legs, so that persons with such constitutions cannot be long lived, but before the usual period they fall into a state of premature old age. And further, the women appear to be with child, and when the time of parturition arrives, the fulness of the belly disappears, and this happens from dropsy of the uterus. Such waters then I reckon bad for every purpose. The next to them in badness are those which have their fountains in rocks, so that they must necessarily be hard, or come from a soil which produces thermal water, such as those having iron, copper, silver, gold, sulphur, alum, bitumen, or nitre (soda) in them; for all these are formed by the force of heat. Good waters cannot proceed from such a soil, but those that are hard and of a heating nature, difficult to pass by urine, and of difficult evacuation by the bowels. The best are those which flow from elevated grounds, and hills of earth; these are sweet, clear, and can bear a little wine; they are hot in summer and cold in winter, for such necessarily must be the waters from deep wells. But those are most to be commended which run to the rising of the sun, and

especially to the summer sun; for such are necessarily more clear, fragrant and light. But all such as are selfish, crude, and hard, are not good for drink. But there are certain constitutions and diseases with which such waters agree when drunk, as I will explain presently. Their characters are as follows: The best are such as have their fountains to the east; the next, those between the summer risings and settings of the sun, and especially those to the risings; and third, those between the summer and winter settings; but the worst are those to the south, and the parts between the winter rising and setting, and those to the south are very bad, but those to the north are better. They are to be used as follows: Whoever is in good health and strength need not mind, but may always drink whatever is at hand. But whoever wishes to drink the most suitable for any disease, may accomplish his purpose by attending to the following directions: To persons whose bellies are hard and easily burnt up, the sweetest, the lightest, and the most limpid waters will be proper; but those persons whose bellies are soft, loose and pituitous, should choose the hardest, those kinds that are most crude, and the saltest, for thus will they be most readily dried up; for such waters as are adapted for boiling, and are of a very solvent nature, naturally loosen readily and melt down the bowels; but such as are intractable, hard, and by no means proper for boiling, these rather bind and dry up the bowels. People have deceived themselves with regard to salt waters, from inexperience, for they think these waters purgative, whereas they are the very reverse; for such waters are crude, and ill-adapted for boiling, so that the belly is more apt to be bound up than loosened by them. And thus it is with regard to the waters of springs.

"I will now tell you how it is with respect to rain-water, and water from snow. Rain-waters, then, are the lightest,

the sweetest, the thinnest, and the clearest; for originally the sun raises and attacks the thinnest and lightest part of the water, as is obvious from the nature of salts; for the saltish part is left behind owing to its thickness and weight, and forms salts; but the sun attracts the thinnest part, owing to its lightness, and he abstracts this not only from the lakes, but also from the sea, and from all things which contain humidity, and there is humidity in everything; and from man himself the sun draws off the thinnest and lightest part of the juices. As a strong proof of this, when a man walks in the sun, or sits down having a garment on, whatever parts of the body the sun shines upon do not sweat, for the sun carries off whatever sweat makes its appearance; but those parts which are covered by the garment, or anything else, sweat, for the particles of the sweat are drawn and forced out by the sun, and are preserved by the cover so as not to be dissipated by the sun; but when the person comes into the shade the whole body equally perspires, because the sun no longer shines upon it. Wherefore, of all kinds of water, these spoil the soonest; and the rain-water has a bad smell, because its particles are collected and mixed together from most objects, so as to spoil the soonest. And in addition to this, when attracted and raised up, being carried about and mixed with the air, whatever part of it is turbid and darkish is separated and removed from the other, and becomes cloud and mist, but the most attenuated and lightest part is left, and becomes sweet, being heated and concocted by the sun, for all other things when concocted become sweet. While dissipated then and not in a state of consistence it is carried aloft. But when collected and condensed by contrary winds, it falls down wherever it happens to be most condensed. For this is likely to happen when the clouds being carried along and moving with a wind which does not allow them to rest,

suddenly encounters another wind and the other clouds from the opposite direction: there it is first condensed, and what is behind is carried up to the spot, and thus it thickens, blackens, and is conglomerated, and by its weight it falls down and becomes rain. Such, to all its appearance, are the best of waters, but they require to be boiled and strained; for otherwise they have a bad smell, and occasion hoarseness and thickness of the voice to those who drink them. Those from snow and ice are all bad, for when once congealed they never again recover their former nature; for whatever is clear, light, and sweet in them is separated and disappears; but the most turbid and weightiest part is left behind. You may ascertain this in the following manner: If in winter you will pour water by measure into a vessel and expose it to the open air until it is all frozen, and then on the following day bring it into a warm situation where the ice will thaw, if you will measure the water again when dissolved you will find it much less in quantity. This is a proof that the lightest and thinnest part is dissipated and dried up by the congelation, and not the heaviest and thickest, for that is impossible; wherefore I hold that waters from ice and snow, and those allied to them, are the worst of any for all purposes whatever. Such are the characters of rain-water, and those from ice and snow."

In this work on "Air, Water and Places," occurs his famous chapter on Urinary Calculus, containing the most ancient observation which we have on the subject. It would be somewhat out of place to quote it here, but it is well worthy of a perusal.

A large part of the remainder of this book is taken up in accounting for the difference in character and disposition of various peoples by the physical geography and the climatic conditions of their places of abode, for example, he says: "And there are in Europe other tribes, differing

from one another in stature, shape, and courage; the differences are those I formerly mentioned, and will now explain more clearly. Such as inhabit a country which is mountainous, rugged, elevated, and well watered, and where the changes of the season are very great, are likely to have great variety of shapes among them, and to be naturally of an enterprising and warlike disposition; and such persons are apt to have no little of the savage and ferocious in their nature; but such as dwell in places which are low-lying, abounding in meadows and ill-ventilated, and who have a larger portion of hot than of cold winds, and who make use of warm waters—these are not likely to be of large stature nor well proportioned, but are of a broad make, fleshy, and have black hair; and they are rather of a dark than of a light complexion, and are less likely to be phlegmatic than bilious; courage and laborious enterprise are not naturally in them, but may be engendered in them by means of their institutions. And if there be rivers in the country which carry off the stagnant and rain-water from it, these may be wholesome and clear; but if there be no rivers, but the inhabitants drink the waters of fountains and such as are stagnant and marshy, they must necessarily have prominent bellies and enlarged spleens. But such as inhabit a high country, and one that is level, windy, and well watered, will be of large stature, and like to one another; but their minds will be rather unmanly and gentle. Those who live on thin, ill-watered and bare soils, and not well attempered in the changes of the seasons, in such a country they are likely to be in their persons rather hard and well braced, rather of a blond than a dark complexion, and in disposition and passions haughty and self-willed. For, where the changes of the seasons are most frequent, and where they differ most from one another, there you will find their forms, dispositions, and nature most varied.

These are the strongest of the natural causes of difference, and next the country in which one lives, and the waters; for, in general, you will find the forms and dispositions of mankind to correspond with the nature of the country; for where the land is fertile, soft, and well watered, and supplied with waters from very elevated situations, so as to be hot in summer and cold in winter, and where the seasons are fine, there the men are fleshy, have ill-formed joints, and are of a humid temperament; they are not disposed to endure labour, and, for the most part, are base in spirit; indolence and sluggishness are visible in them, and to the arts they are dull, and not clever or acute. When the country is bare, not fenced, and rugged, blasted by the winter and scorched by the sun, there you may see the men hardy, slender, with well-shaped joints, well-braced and shaggy; sharp industry and vigilance accompany such a constitution; in morals and passions they are haughty and opinionative, inclining rather to the fierce than to the mild; and you will find them acute and ingenious as regards the arts, and excelling in military affairs; and likewise all the other productions of the earth corresponding to the earth itself. Thus it is with regard to the most opposite natures and shapes; drawing conclusions from them, you may judge of the rest without any risk of error."

We may well believe, that with such a profound knowledge of the effects of "airs, waters and places" upon the physiology and development of individuals, he made use of this knowledge in the treatment of disease as well as recognizing its effect in the etiology of various disorders.

In the light of our present knowledge as to the etiology of malaria it is interesting to note that he observes that in certain places where the wind blows over a marsh intermittent fevers are common, but when the wind blows in the opposite direction these fevers do not occur. In another

place in his work on the epidemics I find that he classes acute phthisis among infectious diseases, such as epidemic parotitis, and that he notes the serious nature of the disease: "Many, in fact most of them, died," he says, though the idea of contagion does not appear to have occurred to him.

The following remarks in regard to phthisis occur in his "Aphorisms":—

"Autumn is a bad season for persons in consumption."

"Sweat supervening in a case of fever without the fever ceasing, is bad, for the disease is protracted, and it indicates more copious humours."

"Phthisis most commonly occurs between the ages of 18 and 35 years."

"In persons affected with phthisis, if the sputa which they cough up have a heavy smell when poured upon coals, and if the hairs of the head fall off, the case will prove fatal."

"Phthisical persons, the hairs of whose head fall off, die if diarrhœa set in."

"In persons who cough up frothy blood, the discharge of it comes from the lungs."

"Diarrhœa attacking a person affected with phthisis is a mortal symptom."

"Persons who become affected with empyema after pleurisy, if they get clear of it in forty days from the breaking of it, escape the disease; but if not, it passes into phthisis."

In his work on "Regimen in Acute Diseases," he has a chapter on the bath which I think will interest our hydrotherapists; it is as follows: "The bath is useful in many diseases, in some of them when used steadily, and in others when not so. Sometimes it must be less used than it would be otherwise, from the want of accommodation; for in few families are all the conveniences prepared, and persons who

can manage them as they ought to be. And if the patient be not bathed properly, he may be thereby hurt in no inconsiderable degree, for there is required a place to cover him that is free of smoke, abundance of water, materials for frequent baths, but not very large, unless this should be required. It is better that no friction should be applied, but if so, a hot soap (smegma) must be used in greater abundance than is common, and an affusion of a considerable quantity of water is to be made at the same time and afterwards repeated. There must also be a short passage to the basin, and it should be of easy ingress and egress. But the person who takes the bath should be orderly and reserved in his manner, should do nothing for himself, but others should pour the water upon him, and plenty of waters, of various temperatures, should be in readiness for the douche, and the affusions quickly made; and sponges should be used instead of the comb (strigil), and the body should be anointed when not quite dry. But the head should be rubbed by the sponge until it is quite dry; the extremities should be protected from the cold, as also the head and the rest of the body; and a man should not be washed immediately after he has taken a draught of ptisan or a drink; neither should he take ptisan as a drink immediately after the bath. Much will depend upon whether the patient, when in good health, was very fond of the bath, and in the custom of taking it: for such persons especially feel the want of it, and are benefited if they are bathed, and injured if they are not. In general it suits better with cases of pneumonia than in ardent fevers; for the bath soothes the pain in the side, chest and back; concocts the sputa, promotes expectoration, improves the respiration, and allays lassitude; for it soothes the joints and outer skin, and is diuretic, removes heaviness of the head, and moistens the nose. Such are the benefits to be

derived from the bath, if all the proper requisites be present; but if one or more of these be wanting, the bath, instead of doing good, may rather prove injurious; for every one of them may do harm if not prepared by the attendants in the proper manner. It is by no means a suitable thing in these diseases to persons whose bowels are too loose, or when they are unusually confined, and there has been no previous evacuation; neither must we bathe those who are debilitated, nor such as have nausea or vomiting, or bilious eructations; nor such as have hæmorrhage from the nose, unless it be less than required at that stage of the disease (with those stages you are acquainted), but if the discharge be less than proper, one should use the bath, whether in order to benefit the whole body or the head alone. If then the proper requisites be at hand, and the patient be well disposed to the bath, it may be administered once every day, or if the patient be fond of the bath there will be no harm, though he should take it twice in the day."

By making these extensive quotations from Hippocrates' works, I have thought I could best put before you his own ideas, not tinctured by any notion of my own. His observations interested me and I hope they have not bored my hearers. I shall close by quoting one of his aphorisms, which is applicable to-day as when it was spoken 400 years before the Christian era, "The physician should strive to do good to his patient or, at least, to do no harm."

CLIMATOLOGY IN THE CURRICULUM OF THE MEDICAL SCHOOLS OF THE UNITED STATES AND CANADA.

By JAMES M. ANDERS, M.D., LL.D.

The accumulated observation of the effects of climate in the treatment of various conditions and diseases abundantly proves that it is one of the most valuable resources of the physician. Medical literature examined in its relations to climatotherapy as a remedial agent, however, reveals the unwelcome fact that it has done but little more than maintain its place with undiminished reputation during the last half-century. Again, at the present day, when non-medical agencies are assuming more and more therapeutic prominence, it behoves those interested in the subject of medical climatology to assign to climate its proper office among curative and preventive measures.

It seems to me that the responsibility for securing new and valued information in this field of scientific endeavour, and also the work of disseminating that knowledge among the medical profession, falls within the legitimate function of this Association, and it may be justly claimed that it has not been playing a passive *rôle* in this respect. Moreover, the American Climatological Association should not be deficient in endeavour to prove the value and importance of including the subject of climatology in the curricula of our medical schools.

It may be reasonably doubted whether our medical col-

leges and universities have followed the light that they have had in the past, in respect to the question of the teaching of this branch of physical therapeutics, and certain it is that the undergraduate has received quite inadequate training therein, as the result. It is generally admitted that a knowledge of the fundamental truths of the science of meteorology must ever serve as a basic requirement for a rational, practical application of the many climatic conditions of this country to the management of disease. At the present day the thorough instruction in physiology and physics which is given in these institutions of learning is just the preparation needed by the student for subsequent training in medical climatology. Moreover, it is possible to give him the principles, on which he can base a selection of an appropriate climate, in a brief systematized course of not more than from three to five lectures. Again, that prominence should be given by this Association to efforts especially directed toward the education of the medical student, rather than to confine its efforts to the work of enlightening the medical profession, is a fact that will be generally accepted.

In 1904 the late Dr. S. E. Solly* called the attention of this Society to the question of the establishment of systematic teaching of climatology in the medical schools at its meeting held in Philadelphia. In order to determine the extent of special training at that time, he mailed a circular to all the medical colleges, to which thirty answers were received. Of these, only seven stated that climatology was included in the curriculum, questions set, and books recommended. "The rest of the colleges said there was no regular instruction, but that the different professors, sometimes the professor of medicine, sometimes of thera-

* *Transactions of the American Climatological Association*, vol. xx, 1904.

peutics, sometimes of diseases of the lung, referred to the matter of climate in connection with the various diseases which they discussed."*

Following the example of Dr. Solly, I mailed a circular (slightly different from his as regards the questions propounded) to all American medical colleges—140 in number—with a view to ascertaining to what extent the movement then proposed to advance the teaching of the science of climatology had succeeded during the intervening period of nine years, as follows:—

Dear Sir,—As I am desirous of ascertaining the status of instruction in climatology in the leading medical colleges of this country, I shall be very much obliged if you will answer the following questions:—

(1) Is climatology included in the regular curriculum?

(2) If so, how many lectures are given; are they in a separate course, or in connection with one or other subjects, and for which year's students?

(3) Are a certain number of questions regularly set in the final examinations; if so, how are the answers rated?

An early reply will be appreciated by

Yours very sincerely,

Of the 140 letters sent out, replies were received from ninety-nine institutions. Of these ninety-nine, twenty-two include climatology in the curriculum, as against seven out of a total of thirty answers received by Dr. Solly in 1904. It will be observed that the ratio of medical colleges in which the subjects under discussion are taught to the total number of responses is practically the same for my figures as for those of Dr. Solly. It would appear, however, that the increased proportion of colleges that responded to my letter, 70.7 per cent. of the whole number, in comparison

* *Loc. cit.*, p. 7.

with Dr. Solly's, or 23.33 per cent. of the total, might be interpreted as showing greater interest at present than at the time he made his collective investigations nine years ago.

In thirteen of the twenty-two institutions in which a specific course is given, questions are set either in the junior or senior years, although nothing of a definite character respecting the rating of these could be learned, with two exceptions, namely, the California Eclectic Medical College, where a minimum grade of 75 per cent. is required, and the University of Louisville, where the answers are rated on the same basis (75 per cent.).

The subject of medical climatology is incidentally taught in fifty-three out of a total of ninety-nine medical colleges and universities, or in 53.5 per cent., from which replies were received. In the accompanying table (Table I) I have given the names of the institutions that give a more or less systematic course of training in medical climatology, the number of lectures per session, and the number of set questions. In Table II will be found those colleges in which the subject is taught incidentally by one or more professors, principally the chairs of medicine, therapeutics and hygiene; also remarks touching upon prospective courses in climatology or an expression indicating the purpose of taking the matter up more seriously in future. My collective investigations have also shown that of the ninety-nine institutions that made reply to my circular twenty-four pay absolutely no attention to the subject of medical climatology.

The object of this discussion is not only to have assigned to medical climatology a more universal place in the curriculum, but also to bring about the systematic teaching of the subject in the medical schools of America. True it is that the time needed may not be available, particularly in

TABLE I.

Name of Institution	Systematic Course in Climatology	Number of Lectures	Number of Set Questions
Leland Stanford Junior University, San Francisco, Cal.	Yes, in connection with physical therapeutics in the sophomore year, and with medicine in the senior year	Only a few	Included with other subjects in the final examination.
California Eclectic Medical College, Los Angeles, Cal.	Yes	Eighteen	Ten; basis of 100 per cent. requiring a minimum grade of 75.
University of Colorado, Denver, Col.	Yes, in connection with therapeutics to juniors; also to seniors under dietetics	Several	
Georgetown University School of Medicine, Washington, D.C.	Yes, in connection with hygiene to junior students	Three	One question in final examination.
Bennett Medical College, Chicago, Ill.	Yes, in connection with therapeutics to junior students	Four	One or more.
National Medical University, Chicago, Ill.	Yes, in connection with therapeutics	12½ hours per term	
Hering Medical College, Chicago, Ill.	Yes	Five or six	
University of Louisville, Louisville, Ky.	Yes, to seniors	Six	Ten; 75 per cent. passing mark.
Tufts College Medical School, Boston, Mass.	Yes, to third and fourth year students	Several	A certain number.
University of Michigan, Ann Arbor, Mich.	Yes, in connection with hygiene	Four to six	One to two.
American Medical College, Medical Department of National University, St. Louis, Mo.	Yes, in connection with hygiene	Four	
Albany Medical College, Albany, N.Y.	Yes, in connection with therapeutics to junior students		
New York Homœopathic Medical College, New York, N.Y.	Yes, to seniors	Five	Two in the final examination.
Cornell University Medical College, New York, N.Y.	Yes, in connection with medicine and hygiene to juniors and seniors	Two	
Cleveland Pulte Medical College, Cleveland, Ohio	Yes, in connection with hygiene to seniors	Two	
College of Medicine of the State University of Oklahoma, Oklahoma City, Okla.	Yes, in connection with didactic medicine to juniors		
Jefferson Medical College, Philadelphia, Pa.	Yes, in connection with therapeutics to seniors	Three or four	One or two in the ten questions on therapeutics.
Medico-Chirurgical College, Philadelphia, Pa.	Yes, to seniors	Four	
Baylor University, Dallas, Texas	Yes, to seniors	Twelve	Ten.
Southern Methodist University, Dallas, Texas	Yes, to sophomores	30 hours a year	A certain number.
University of Vermont, Burlington, Vermont	Yes, in connection with hygiene (two hours)		
McGill University, Montreal, Canada	Yes, in connection with therapeutics to seniors	Two or three	One or more.

TABLE II.

Name of Institution	Climatology taught incidentally	Remarks
Birmingham Medical College, Birmingham, Ala.	With the discussion of treatment of disease by the Professor of Practice during third and fourth years.	
University of California, Los Angeles, Cal.	In connection with the clinical work in general clinical medicine during third and fourth years.	
College of Physicians and Surgeons, San Francisco, Cal.	Yes, in connection with medicine.	
Oakland College of Medicine and Surgery, Oakland, Cal.	In connection with the various diseases in about the same way that massage and hydrotherapy are considered.	
College of Physicians and Surgeons, Los Angeles, Cal.	Yes.	
George Washington University, Washington, D.C.	In connection with the course in hygiene.	
Howard University Medical Department, Washington, D.C.	Yes.	
Atlanta School of Medicine, Atlanta, Ga.	In connection with therapeutics to senior students; examination might include one or more questions.	
Rush Medical College, Chicago, Ill.	In connection with the medical clinics, usually those on tuberculosis.	
Hahnemann Medical College, Chicago, Ill.	One of the faculty gives a system of lectures along this line.	
Northwestern University, Chicago, Ill.	Yes.	
Chicago College of Medicine and Surgery, Chicago, Ill.	In connection with preventive medicine.	
Drake University, Des Moines, Iowa.	In connection with the course in hygiene	Might be able to make more use of it in another year
University of Kansas, Rosedale, Kansas.	Only mention of the subject in hygiene.	
Tulane University, Medical Department, New Orleans, La.	Yes.	Will refer the matter to the Departments of Medicine, Tropical Medicine and Hygiene.
Medical School of Maine, Portland, Me.	In connection with the departments of of medicine and therapeutics.	
Baltimore Medical College, Baltimore, Md.	In connection with medicine	Curriculum crowded.
Maryland Medical College, Baltimore, Md.	Included in the regular course on the Practice of Medicine to third and fourth year students.	
Harvard University, Boston, Mass.	Discussed with tuberculosis and other diseases in which climatology plays a part in the treatment.	
Boston University School of Medicine, Boston, Mass.	In connection with sanitary science; final examination might include a question or two.	
Detroit Homœopathic College, Detroit, Mich.	Given only in connection with sanitary science.	

Name of Institution	Climatology taught incidentally	Remarks
University of Minnesota, Minneapolis, Minn.	In connection with medicine and public health	No effort has been made to devote special attention to it.
University of Mississippi, University, Miss.	In connection with the work on hygiene and sanitation during the second year course; examination might include one or more questions.	
Washington University Medical School, St. Louis, Mo.	Has not been taught very thoroughly	Curriculum now being reorganized
College of Physicians and Surgeons, St. Louis, Mo.	In connection with physiology and therapeutics in the second year's work.	
University Medical College, Kansas City, Mo.	Included in the Chair of Practice of Medicine as a therapeutic measure applicable in certain diseases, and given in the third and fourth years; certain number of questions in final examination.	
St. Louis University School of Medicine, St. Louis, Mo.	In connection with the course in hygiene.	
Dartmouth Medical School, Hanover, N.H.	In connection with medicine to seniors.	
Long Island College Hospital, College Department, Brooklyn, N.Y.	Yes.	
Syracuse University College of Medicine, Syracuse, N.Y.	In connection with the teaching of internal medicine.	
University and Bellevue Hospital Medical College, New York, N.Y.	Included in medicine and therapeutics during the third and fourth years.	
University of North Dakota, University, N. Dak.	In connection with the course in hygiene; half school, only giving two years of medicine.	
Western Reserve University, Cleveland, Ohio	Only very incidentally in other courses.	
Toledo Medical College, Toledo, Ohio	In connection with other subjects to senior students	
University of Cincinnati, Cincinnati, Ohio	In connection with the regular courses in therapeutics.	
Williamette University, Salem, Oregon	Yes.	
University of Oregon, Portland, Oregon	In the course of collateral lectures.	
University of Pennsylvania, Philadelphia, Pa.	Yes.	
Woman's Medical College of Pennsylvania, Philadelphia, Pa.	In connection with medicine.	
Hahnemann Medical College, Philadelphia, Pa.	In connection with the course in medicine	Glad to have suggestions in regard to climatology; will bring it up before the faculty.
University of Pittsburg, Pittsburg, Pa.	In connection with the course in hygiene.	
Temple University, Philadelphia, Pa.	Subject covered in a general way by the Chairs of Practice of Medicine and of Therapeutics.	
Meharry Medical College, Nashville, Tenn.	In connection with the practice of medicine and hygiene.	

Name of Institution	Climatology taught incidentally	Remarks
University of Tennessee, Memphis, Tenn.	In connection with practice of medicine and tropical medicine.	
University of Texas, Galveston, Texas.	In connection with the Chair of Medicine and Therapeutics; formerly ten or twelve lectures were given, but curriculum became crowded, so that they were discontinued.	
University of Virginia, Charlottesville, Va.	In connection with the course in therapeutics to third and fourth year students.	
University College of Medicine, Richmond, Pa.	In connection with the course in hygiene and practice of medicine in the second, third, and fourth years.	
West Virginia University, Morgantown, W.Va.	Yes; half school; only two years' course.	
Marquette University, Milwaukee, Wis.	In connection with internal medicine	Would like any suggestions.
University of Wisconsin, Madison, Wis.	Yes, only have a two years' course.	
Dalhousie University, Halifax, Nova Scotia	In connection with therapeutics and hygiene.	
Queen's University, Kingston, Ontario	Dealt with by various teachers in medicine.	
Laval University, Medical Department, Quebec	Yes.	

the senior year, but this fact need not cause us to resign the hope of accomplishing the minimum of instruction in the elements of meteorology in our medical colleges. To effect this it is necessary to have an exact and comprehensive plan. I am of opinion, based upon the character of the responses received to my letter of inquiry, that a special committee could, through dignified and proper intercessions, pursue a successful campaign in this direction. In a timely article by Hinsdale,* the details connected with the teaching of climatology and climatotherapy—an aspect of the subject which cannot be discussed here—are carefully considered.

The deans of two schools have requested of the writer

* "Some Aids in Teaching Climatology and Climatotherapy," Medicine, Detroit, November, 1906.

advice with regard to the question of the most appropriate way in which to accommodate a course in medical climatology to the curriculum. My own particular view, expressed in reply, was that it should form a part of the studies of the junior year, thus serving as a foundation for the practical application of climates to the management of suitable diseases in the senior year—a subject which is then brought to the attention of the student in the course of the discussion of clinical cases by the professors of clinical medicine and applied therapeutics.

It will be observed that in those institutions in which a specific course in medical climatology is given there is no definite place assigned to this branch in the curriculum, although in a majority of instances it is considered in connection with either hygiene or therapeutics. For example, an analysis of the twenty-two colleges of America in which this subject is systematically taught reveals that in seven it is in connection with therapeutics to either junior or senior students, in six with hygiene, and in two only with medicine to juniors or seniors.

A glance at the subjoined Table II will show that of the fifty-three colleges which teach the subject of medical climatology only incidentally, twenty-two are in connection with medicine, ten with hygiene, ten with therapeutics, three with sanitary science, one with dietetics, one with physiology, and one with tropical medicine.

That judicious agitation of the subject under discussion may be carried on with encouraging results is shown by certain statements made by the deans in reply to my circular letter. In four colleges—the University of Iowa, Tulane University of Louisiana, Hahnemann Medical College of Philadelphia, and Memphis Hospital Medical College—in which the subject of medical climatology has either not been taught or only incidentally in the past, it has been decided

to inaugurate a separate course in the elementary principles of meteorology at once.

Certain inferences may be safely drawn from the foregoing facts and data: (1) That the most striking positive evidence obtained by this inquiry goes to show that the subject of medical climatology receives too little recognition in our schools of medicine; (2) from the character of the responses received to the series of questions propounded, co-operation on the part of medical faculties and pedagogic authorities would be readily given to efforts to introduce the teaching of this branch into our institutions of medical learning; (3) that the American Climatological Association could do no better, no more useful work than to foster and promote this movement through a special committee, and a well-directed campaign of education, for its own credit as well as for that of the entire medical profession of America; and (4) that the instruction to be given should be confined to the elementary principles of meteorology in the junior year, since this would be sufficient to enable the student to select a suitable climate in clinical cases presenting an indication for this valuable remedial measure.

DISCUSSION.

Dr. GUY HINSDALE (Hot Springs, Va.) believed that the paper of Dr. Anders was a very timely one, and there was no more proper field for the Association than to promote the teaching of climatology in medical colleges. It was wonderful how students became interested in collateral branches of this kind when their attention was called to them. For several years Dr. Hinsdale has been giving lectures on climatology in Philadelphia, and he obtained much aid from the use of lantern slides which were furnished him by the University of Chicago. Prof. Goode was deeply interested in the subject of meteorology, and furnished him with a large series of slides. He has published a complete descriptive catalogue from which selections of slides could be made. At Tuft's Medical College Dr. Otis uses a

similar collection of slides showing meteorological features, particularly in reference to conditions of temperature, barometric pressure, humidity and rainfall throughout the country. The slides were very satisfactory.

Dr. Hinsdale made it a practice to have some lectures printed from year to year, and so was able to hand to students several printed lectures; this saved the necessity of repetition. If medical colleges would allow four or five lectures, amplified by "quizzes," together with the handing out of these prints, it would be admirable. He found that the United States Public Health and Marine Hospital Service published valuable reprints of papers written by surgeons in various parts of the world on climatic treatment of tuberculosis, the occurrence of hæmorrhages at high altitudes, and so forth, and these were furnished by the Government in large quantities and distributed to the students, whose interest was stimulated in this special field. It was very helpful both to the student and teacher.

Dr. Hinsdale thought that the American Climatological Association should take this matter up and try to stimulate more the teaching of climatology. Recommendations might be made as to how the lecture course should be developed, and subjects assigned so that the teachers could follow along some systematic line.

Dr. CARROLL E. EDSON (Denver, Col.), referring to the number of colleges in which climatology was taught according to the statistics given by Dr. Anders, said that if they would investigate they would find that there was rather a large number in which this course was to be found in the catalogue only.

He said he had had some experience in trying to teach students climatology, and he believed that the giving of but four lectures was inadequate except to lay the foundation for further study. One could not give the student a clear idea of how climate affected the physical economy, heat production, and so forth in four lectures, when they started in the study without knowing anything about weather observations or the elements of meteorology. In large schools, where a preliminary training and education were required in physiology, the students did know the things necessary for the study of climatology. In his experience he had found the idea prevalent in the minds of many that in schools throughout the country with good medical equipment not enough attention was paid to those studies which should serve to lay the foundation for climatic therapy. Some looked upon climate as a panacea; some thought that it came in packages.

Dr. Edson thought that such a course of study as was suggested by Dr. Anders, backed by the American Climatological Association, would be of the greatest advantage. He doubted, however, if a satisfactory course could be given in four lectures.

Dr. CHARLES L. MINOR (Asheville, N.C.) said: We all realize

that some day climatology will become a definitely worked out and practical science, but at present it scarcely occupies this position, and I do not believe that there is very much of real value that we could teach our students on the subject. I have read many books on the subject, and they interested me as a doctor occupied in the treatment of pulmonary diseases, but in no work have I found information of the kind that would be of great help. Meteorology, of course, is much more thoroughly understood and developed, but this is not in the hands of doctors, nor is it likely ever to be, or to be well understood by them. I fear that it may be considered heretical in me to say that the climatology is as yet so little of a science, but I do not believe that it is a subject of which as yet a systematic series of lectures to medical students can be given with advantage.

Dr. JAMES M. ANDERS (Philadelphia, Penn.) closed the discussion. He said he did not wish to take up any additional time of the Association, but in regard to what Dr. Hinsdale had stated, he agreed that it was the legitimate function of the American Climatological Association to encourage the teaching of this branch of medical science in medical colleges. He felt that if the third year student or the junior student were given a brief course in the elements of meteorology he would have something on which to base the selection of a suitable climate in various diseased conditions. The latter aspect of the subject should be brought to the attention of students during their senior year. Medical schools could not expect to do more than give a mere outline of the science of meteorology. The present-day medical curriculum would not permit any extended course. However, a lecturer who was qualified could present sufficient facts and data in four or five lectures to lay the foundation for future practical work. He had considered this matter carefully, and these were the conclusions he had arrived at finally. The fact that our knowledge of the science of meteorology and of climatology was not advanced was not a good reason why no effort should be made to give medical students that nucleus or slight foundation on which they could subsequently build.

THE NEGRO AND HIS HEALTH PROBLEMS.

By J. MADISON TAYLOR, M.D.
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THE negro problem is one of anthropology, not one of ethics, religion, or variegated opinions. It does involve grave sub-problems of humanity, economics, and common sense.

Under no circumstances should it be complicated by emotion. The whole race problem, in the final count, resolves itself into what is to become of the members of an alien people transported by force, and suddenly, to an unsuitable, a hostile environment.

Members of this alien race deserve the same consideration as those of any other; no more, no less. They will get it, and all the more readily if partizanship, unreflecting zeal and politics can be kept upon a rational level.

Prejudices for and against the negro neutralize each other. They only serve to obscure fundamental issues, producing no good, but only loss of vitality and moral tone in those who entertain them.

The question for solution resolves itself into *whether members of a tropical race, evolved through thousands of years in hot countries, whose characteristics have gradually become adapted to local climatic conditions, are capable of flourishing or even surviving in a climate wholly at variance with the circumstances of their racial adaptations.**

* Another important anthropologic problem is whether a people practically in or near a state of savagery can be expected to become civilized or conform to civilized standards within the short space of a few hundred years. This is not germane to the present inquiry.

If the answer is in the affirmative, then is opened a host of doubts as to the validity of all experience, history, and the findings of anthropologic science; also complex questions arise as to what will become of the race till time, the greatest solver of problems, shall reveal.

If the query above proposed is answered in the negative, we should at once consider what can be done to effect a transference of the negroes to a suitable habitat.

Two or more races brought into intimate contact, socially and domestically, evolve hybrids. All experience shows that hybrids, the product of sexual union of antithetic races, such as the white and the black, are inferior to the original stock, physically and morally. It is demonstrated by well-attested facts that these hybrids of black and white are vastly more susceptible to certain infections; their moral as well as physical stamina is lower than that of either original race. Undoubtedly there are individual exceptions.

Hybridism lowers normal defences to degenerative diseases, hence inhibition, the fundamental safeguard, is lessened and degenerative processes then proceed with increasingly rapid strides as the alien blood weakens and the stronger prevails.

In America the supply of the original negro blood is limited; no new infusions are to be expected.

Meanwhile, pure streams of our Anglo-Saxon, Slavic, Celtic and other blood, infused as they are in the United States with a different but not largely variant group of Latins, Hebrews and others, is polluted by the Negroid blood. However, those who feel alarm at this fact can take comfort from the reflection that it is contrary to all precedent for a tropic race (so entirely unfit to subsist in a cold climate, like ours) to survive more than ten, or at most fifteen, generations. Our sub-tropical summer may prolong survival more or less.

Education for the negro during emancipation days and long thereafter was slow to receive adequate attention. Race prejudice took on almost unbelievable phases, among which was opposition by the Southern whites to providing adequate opportunities for equivalent education.

Slowly but surely these difficulties are being adjusted. It is a splendid testimony to the inherent good sense of the negro, to his capacities for swift regeneration, that the chief impetus for education (after General Armstrong pointed the way) arose among, and is sustained by, his own people. They are learning, too, that the form and character of this education must be specialized, simplified, along lines of primitive needs, industrial and agricultural. The fundamental requisite is the inculcation of laws of right living, the basis of which is the mutual sharing of responsibilities provided by family life. Domestic hygiene once taught in the schools promptly and radically regenerates that of the household.

Since the manumitted slave is essentially a bankrupt, without capital, all he has to exchange for a livelihood is his ability to work.

In this work he begins as a mere assistant in production, but may then attain to any height of endeavour for which the individual is fitted or on which he is capable of specializing.

Physical fitness is the *sine quâ non* to comfortable as well as useful existence. The problem of health of such an individual is thereupon demonstrated to be paramount.

No line of endeavour is capable of accomplishing so much as one which furnishes opportunities to the wage-earner for learning how to maintain personal health at a maximum.

This one central thought must be kept in mind by all who endeavour to solve health problems of the negro. No race, which has evolved slowly and acquired definite physical

characteristics, can be transplanted suddenly to wholly alien conditions, climatic or other, and adjust themselves to these new and trying conditions, except through a period sufficiently long and by slow evolution.

The negro is an essential part of the body politic. Health problems of the Afro-American stand close to those of all other citizens.

Ten million human beings, differing in racial characteristics, yet closely interwoven with others, socially and domestically, demand critical observation. While valuable aids, they are also serious menaces. During the period of enslavement physical conditions were vastly better. There is so much evidence nowadays of deterioration among negroes, induced by the effects of unaccustomed freedom, that the question of their betterment constitutes a vital part of national economics.*

Throughout the length and breadth of our Southern States, and to a lesser degree elsewhere, negroes constitute a large ethnic factor. Among them are splendid personalities, yet the majority lack elements of stability, of dependableness. They are too often their own worst enemies, deficient in fixity of purpose, in judgment, in those reliable characteristics which fit them for citizenship. Intellectually and morally they resemble children. When, unfortunately, they became a political issue, endless complications arose. Scholastic opinions circulated by ignorant, often venal, meddlers, insisting upon vague altruistic plans, created a chaos on which too little practical light has as yet been shed. Forces are now at work which may solve the more urgent perplexities.

* I myself was a slave-owner, living in boyhood on a plantation. My having then and now much to do with the black peoples may qualify me to express more accurate and just opinions than those who have had no such actual experience.

The negro is too often a creature of impulse, of emotion, of shallow impressionability, and swayed overmuch by mere physical promptings. He is a good imitator, which constitutes a valuable equipment for certain kinds of usefulness. Along with these adolescent qualities there are frequently to be found individuals of keen intelligence, good moral perception, faithfulness to friends, and of deeply religious feeling. When unmarred by damaging environment, ill-usage or vitiating influences, the negro is a far more reliable citizen than are some Europeans. It will be generally admitted, by those not steeped in prejudices, that the unspoiled negro is ofttimes a most estimable, lovable person. The vitiated negro is, however, a peculiarly uncertain, explosive and dangerous creature. It is safe to assume that had the process of emancipation progressed more slowly, along the lines of intelligently guided evolution, the negro population would now constitute a valuable group of citizens. Unfortunately, he became a political bone of contention, and was suddenly projected, unprepared, as an equal upon society from the position of an hereditary dependent, unprovided with knowledge or training for the next social phase, *viz.*, that of a free and responsible factor in the Commonwealth. The confusion into which he was forced by the period of reconstruction (the product of a devastating war largely in his behalf) created many complications making for physical decrepitude.

Accustomed for generations to dependency, to serf-like conditions, to paternal harboring; or, on the other hand, subjected to occasional cruel, reasonless injustice, there is little wonder that one so constituted fell promptly under the sway of evil influences, of temptations, became often licentious, brutal, or savagely retro-actionary. The mischief-making, self-seeking "carpet-bagger" found in him a tool ready to his hand; and rum, rapine and rebellion ran riot.

Industries were then paralyzed, reorganization was slow and imperfect, the whole local social fabric suffered, the burdens falling heavy enough upon all, but most crushingly on the crude, plastic, unformed negroid element.

To-day a deplorable condition of affairs prevails among these alien racial elements of the community. Many of our duties to them are not adequately defined, nor are the factors precisely determinable. All will become plain as prejudices on both sides subside and self-seeking politics finally gives way to statesmanship. The solution can only be by patient, tolerant compromises, always utilizing the principles of critical science and true Christianity to guide our decisions.

Solution of the health problems of the negro would seem to be particularly significant and urgent, so intimately interwoven are they with the industrial. The most obvious need is for education of the young in principles of citizenship. No remedy can exceed in value implanting the seeds of self-respect, of industry, of responsibility, of obedience to constituted authority. The most urgent measure is for legislators to control the sale and distribution of delirifacient poisons. Bad as the vitiated negro is, he is an angel of light in his original state compared to any negro crazed by alcohol, cocaine or morphia.

This is the one factor that for the moment overwhelms and obscures all others. Remove or reduce to determinable limitations the accessibility to narcotics and the residue can be dealt with by reasonable means. In establishing punitive measures against free access to alcohol, and narcotics, some innocent persons will doubtless suffer with the guilty; *i.e.*, a few free-born whites may be deprived of their Heaven-sent privilege of going to Hades in the fashion of their choice. This indirect "injustice" or "evil," if such it be, can be endured if only adequate restrictive legislation shall be ultimately secured and enforced.

The proposition would seem thus placed directly up to the voter and the legislator.

Under slavery the health of the negro was peculiarly good, well in advance of the rest of the community. Tuberculosis was then practically unknown among the blacks. In comparing their status then and now, something may be conceded to the whole group of aggravating conditions then prevailing, compounded of ignorance, defective instincts, laziness, improvidence, morbid optimism, effects of poverty and the like. All these factors, however, are, at their worst, little things compared to mental and moral vitiation through the destructive effects of narcotic poisons. These bear heavily on collateral health problems; *e.g.*, susceptibility to tuberculosis, whereto the negroes are shown to be now three times as liable as the whites.*

Are we now, as a nation, prepared to deal efficiently with these obviously crucial, though deeply intrenched abuses? How can the paramount significance of this proposition be brought to the consciousness of our citizens?

The negro of the rural sections of the South is now, according to the evidence, in a far better condition of health and morals than the negro of the cities. My personal observation is at the present time chiefly of the urban coloured population, far north of their normal habitat. Here a deplorable state exists, part of which is due to natural causes, chiefly climatic. It is far worse than among those races which, through generations of selection and specialization, have become adjusted to urban confinement and restraint. Especially is this true of the Hebrews, who by long evolution have acquired relative immunity to many infections, and resistance to the effects of depressing influences. It will require no less than centuries for the negro

* See "Tuberculosis in the Negro," by Seale Harris, M.D.

to become adjusted to cold climates. He is unfit racially to flourish above the latitude of Mason and Dixon's Line. All those who know the facts urge that the negro shall never attempt to remain above the line of the Carolinas. Unless the negro is endowed with inherent potentialities radically different from those of all other tropical races, he will deteriorate and perish in cold climates. Just as the northern races, like the Goths and Vandals, who conquered Southern Europe, deteriorated and disappeared in a few generations, so will any weaker race from the hot South disappear in the North.

The negro is essentially a creature fitted to dwell in wide spaces under the vault of heaven. He must have access to the sun. He is not to be expected, at least not for many generations, to labour so regularly or so continually as one less recently in a savage state. Good work he can do; but those who know him well are aware that the incentives to do his best are not the same as for the Hebrew, the Celt, Slav, German or Italian. Long monotony, confinement, deprivation of normal solaces to his semi-savage spirit induce gloom, revolt, explosions of retroactive impulses. He needs praise, kindly encouragement, personal solicitude and direction, and will then often surpass himself. Fortunately he is growing ambitious to copy the best in the methods of those about him, and will succeed, provided he is aided by wise, firm and kindly guidance. The negro has become more or less of a political power and it is fortunate that in his views, opinions and decisions his guides are usually the clergy of his own race. It is a blessing that these coloured pastors are in the main good men, clear-sighted, aware of the gravity of their position, their unique power. Many of them seem fortified by dignity, self-respect and conscientiousness. They exhibit a deeper interest in the personal welfare, and especially the mental and moral training

of their flocks than do those of many other religious bodies. The danger is that too many of them are not men of broad views, with minds above mere financial considerations in the administration of Church economics. They are often insufficiently alive to physical or hygienic needs, especially ventilation, temperance and wholesome living. My personal experience with certain of these pastors is most disappointing. They exhibit a degree of narrowness, of selfishness, greatly to be deplored. It is almost impossible to impress some of them with their paramount duty to advise their flocks to seek the country, especially the warm countries, where alone they are racially fitted to flourish—even to survive. Fortunately there is now a large and growing body of negro physicians, dentists and pharmacists.*

It is obviously through education in right feeling, thinking and doing, that any considerable advances can be effected in the ultimate evolution of the black race. The basis of this advance is to encourage in all ways wholesome instincts; to make the integrity of the family the point of departure for all effort, all rewards.

Purity of race is always of paramount value. Hybridism leads to all sorts and degrees of constitutional vitiation. Autochthony is an important condition of racial advance. Before freedom the negro was a chattel, and whether the progeny was white or black, it was equally utilizable. The admixture of a highly-cultivated white male with the more simply organized black female produced then a superior article of commerce, a greater promise of available capacity in the product.

* There recently met in Baltimore a National Association of these professions, with a membership of three hundred, and two thousand coloured men are practising medicine and the allied professions in the United States. Much may be expected from these educated and enlightened persons which will redound to the essential betterment of the race.

The autochthony of the black race is better assured since freedom, because marital alliances can now be at least more stable. Marriage with whites is rare and forms a negligible factor. This state of familial stability is to be welcomed; if assured it will then make for racial betterment.

Hybrids are of proverbially low resisting power to morbific agencies, physical and psychical. This is particularly true of the mulatto and other grades of negroid admixture. The pure blood negro holds the mulatto in deep contempt. The negro is essentially domestic, and while by no means so conscientious in sexual matters as some races, often exhibits commendable capabilities for faithfulness.

Vagrant tendencies were exaggerated "before the war" by divers causes, the chief of which was the power of the owner to dispose of slaves diversely.*

All over the South, schools and colleges for the negro are being established; most of them through the initial impulses emanating from Hampton, Fiske and Tuskeegee. Also far-seeing, benevolent men and women of the North are giving of their time, strength and means to this incomparable object.

Thus can we look with some confidence to the final solution of the health problems of the negro.

* An important observation made by several Southern physicians is to the effect that sexual lawlessness, resulting in lynchings, is to be explained thus. The male negro is nearly always infected with gonorrhœa. He neglects treatment habitually. Chronic prostatic irritation ensues. Thus sexual impulses frequently become overmastering. Alcohol particularly inflames this state and likewise dethrones reason; hence the first female he meets he is tempted to assault. This is often a white female; thereupon the fury and vengeance of white men are excited and disastrous results follow to the negro.

MEMORABILIA.

Extracts from Medical Notes made by the late Henry Ingersoll Bowditch, M.D., of Boston.

By VINCENT Y. BOWDITCH, M.D.
BOSTON.

The title of my paper is the result of looking over a series of manuscripts, prepared as a *résumé* of his "Life Work" by my father for his Harvard Class Report Book. I found among them several short articles which contained much that was interesting in giving the personal touch to various medical subjects, and I then conceived the thought of placing a few of them before this Association, the objects of which always had his cordial sympathy. In selecting these extracts I may be accused of going outside the strict limit of subjects supposed to be touched upon by our Society; but as they bear upon the life work of one who took such keen interest in our transactions and who offered to us in 1889 the last and perhaps the most picturesque paper of his life, I have felt justified in deviating slightly from the usual custom.

The paper I refer to was entitled "Open-air Travel as a Cure for Consumption," a record of the life of his own father subsequent to severe pulmonary hæmorrhages at the age of 35. Some of us will remember the picturesque account of the long buggy-ride taken by his father through New England, in 1808, covering a period of many weeks after his illness; of the successful result, and the fact that

he died, an old man, thirty years afterwards, of another disease, the cicatrix of the old pulmonary lesion having been found after death. The salient point of this interesting paper was the insistence upon the importance of fresh air, regular, judicious exercise and simple, nutritious diet, all elements of general hygiene, which seemed to have been insisted upon by a wise physician living in the early part of the last century and carried out faithfully by his patient. The paper has proved a classic in giving evidence of the truths contained therein, while couched in language that holds the attention as something unusual in its manner of expression.

One of his first notes refers to his translation of the great Louis' work upon "Gastro-Entérite" (Typhoid Fever) which he published in 1836. Incidentally he speaks of Louis' methods and of his deep affection for his great master. He writes in 1885:—

"My first thought on my return from student life in Paris (1832-34) was to give to the English-speaking people a translation of this great work, which, with the 'Numerical System' (of which the volumes are an admirable exposition), has had greater influence towards a more scientific study of Medicine than any work that has, in modern times, been published. 'Perpendendæ et numerandæ Observationes' was the motto of the '*Société Médicale d'Observation,*' which Louis founded, and of which he was 'Perpetual President.' By the influence of that Society in Paris, and similar ones in other cities, he hoped to introduce more accurate observations of disease and, in numbers, to express the frequency, &c., of every symptom and of the lesions found after death. None but those who loved the naked truth more than their own fancies or ill-recorded data could easily bear the criticisms made at the meetings; still less could they have a kind of grim satisfaction in them as

vehicles of immense good to everyone present, more especially to the reader himself. For many months I was a member of the Society, and under the teaching of this excellent man. His influence I feel now (1885) as great as ever it has been during my life, and it is seen in every medical paper I have written. The 'Société' considered me worthy to be one of the 'elect.' At the reading of my first paper before it, there were, I think, about twenty seated at a table of a horse-shoe form. Each one had paper and pencil before him. Louis, in the centre of us, presided. I gave the final summing up of the paper's shortcomings. It was one of the sacred rules that each one should feel himself bound to notice every deficiency in the 'Observation' presented, and to openly give his criticisms. Anyone who feared injuring the feelings of the writer and should neglect this criticism would be deemed unworthy as a member. Anyone 'thin skinned' enough to be hurt by the severest examination was considered a fool, totally unable to appreciate the fine *tonic* effect of a pure, friendly, but sharp, criticism from others; all equally desirous with himself of arriving at sacred truth. How well do I remember my first ordeal, and Louis' pungent *critique* upon a certain part of my paper, and his conclusion that 'as Mons. Bowditch had not recorded certain data about the heart he might as well have omitted all mention of that organ.' I thought then and I still think that meeting one of the most refreshing and invigorating I had ever attended. It was really an intellectual 'bitter tonic,' and I was soon feeling prepared for another trial, with the determination to outdo myself. Louis (dear friend, as he was) seemed to fear that the criticisms had, perhaps, been hard for me; and before the next meeting was called to order he smilingly said, 'Well, my dear! we attacked you severely last evening; but you must remember that we never can criticize anything that is not good!' *Politesse française! qu'elle est amiable!*

"Under such influences, and in Louis' 'Clinique' daily I spent two years of the most delightful of my life. It was only a continuation of the same influences when I undertook the translation of Louis' works (1836)."

The next note refers to his experience in studying the development of the ova of the lymnæus or common snail, under the microscope. This work, exquisitely illustrated in pencil by his wife, gives evidence of the patience of both in watching for several seasons the gradual growth of these little creatures. He says:—

"A series of annual microscopic studies of the minute, transparent ova of the snail, was not only a delightful study and illustration of the Cell Theory, but a constant source of religious inspiration far above creeds. I saw an egg shell, with its little mass of granules; *apparently* at rest, but really from the earliest hour of birth beginning its circular movements upon itself, and also gyrations around within the shell. At first this movement was so slow that it could not be recognized save by placing it in a certain part of the field of vision, and examining again after the lapse of some minutes. As Agassiz admitted when I said it seemed like planetary law, and he replied, 'Yes, Doctor, it is the same that governs the planetary bodies.' Out of these movements and its *unseen* 'principle of life' through cells and secondary cells inside of the larger ones, I saw organs develop themselves in most perfect beauty. What was more, I saw *function* showing itself in the *unformed* cells; for example, in the heart, one of the most exquisite of structures, with its auricle and ventricle, and its opening and closing auriculo-ventricular valve which it seemed as if I could *auscult* as I do the sounds of the human heart! I had become so acquainted with the various processes and the places in the midst of still unarranged cells, where the organ would appear, that, in fancy, I placed the perfect

organ there. One day, when thus thinking and looking, a sudden contraction of the bunch of cells took place. I said, 'How Fancy deceives even our own senses! I must have been mistaken,' and the part rolled out of sight. On watching farther, however, and upon several occasions, I learned this fact that *function* is emplanted in the future organ *even before it is formed!* I was able by having proper apparatus and a number of microscopes, to show the gradual development of the little creature until by its spikey tongue, it tore its way into the external world—not larger than the most minute grain of sand, and only really recognizable by the microscope. My scientific knowledge and my religious nature were alike improved by this study. And I never heard or read a more eloquent series of sermons than were given by these scientific studies in the Springs of several successive years (1845-6-7-8)."

In the third note, which contains a therapeutic suggestion quite within the lines of our practice in this association, his allusion to Amos Twitchell, of Keene, N.H., one of the best of men and among the cleverest of physicians in the middle of the last century, has a quality which is of interest to our profession. In speaking of the Memoir of his friend which he was asked to prepare, he says:—

"Dr. Twitchell was one of the most remarkable men I have met either in or out of the profession. He was a *massive* man in every way. He was the class-mate and friend of Daniel Webster. As a surgeon, he was imperturbable; fertile of resource and in unexpected cases never at a loss. He would defy all the stereotyped rules of surgery, when he met an unusual accident. Instead of letting the patient die by the 'Providence of God' he would attempt, at least, to save him by the sagacity of man. His ability was never more splendidly shown than when he tied up the carotid artery, which previously good surgery forbade, and thereby not only saved the youthful sufferer, but

gave a new practical rule for surgeons instead of an effete dogma, founded on theory rather than experience. At one time, he drove in his 'one hoss shay' in a circle, with a more than fifty miles radius. He was so well known, and everywhere could claim a relay so promptly, that he would arrive as punctually at a great distance as we now do by our railroad devices. He was a kindly man, and yet such a hater of shams that he has left phrases behind him that sparkle with a spice of bitterness. 'That man cheated me,' he would say, 'worse than the Deacon would.' He was a great joker and even late in life practised jokes upon his townsmen when a fit occasion arose. He hated rum and tobacco, and always was a great preacher against both, when surrounded by his friends and neighbours near the tavern, in early days, and at the depôt during his later ones. He studied nature rather than books. For years, in the summer, I loved to meet him at Keene and listen to his words of practical wisdom, and to gain cheerfulness of spirit from his overflowing fund of humour. To him I owe the *one* recipe that scarcely ever fails me. It seems but yesterday I met him at the depôt. I was just leaving for Boston after a visit of two weeks at that (then, certainly) delightful spot, Keene, N.H., famous, in my eyes, for its sweet homes of lovely and intelligent women and of solid men of sense, and of whom Twitchell was '*primus inter pares*.' Suddenly he said, 'If you ever have a *rheumatic* case of *orthopnœa* I want you to try a pill I am sure you will find useful. I received it twenty-five years ago from Professor Nathan Smith, of New Haven. He had used it twenty-five years with great satisfaction.' I have used it at least thirty-five years,* so that the combination has a 'pedigree' of at least

* ℞ pulv. digitalis, gr. x; pulv. colchici. sem., gr. xx; sod. bicarb., gr. xxx; in 20 pills or powders—one three times or more daily.

N.B.—Let none but the purest articles be put up by perfectly honest druggists.

eighty-five years' use, by three men of (I trust I may say) common sense, and of large practice, and two of them (Smith and Twitchell) giants in their day. I have not known the remedy to fail wholly, in a case of orthopnœa, in which the *heart's* action was chiefly at fault, whether the difficulty was organic or functional. Some may smile at this proclamation of the virtues of a pill! 'Garrulous, foolish old man' may be the thought of many. But the fact that, many times during these thirty-five years, I have been able to relieve most horrible distress, and to restore to life and to the blessed power to work again in this world, is my excuse. Those acts have been among the most pleasant of my 'life work' in my profession to recall, and to Nathan Smith and Amos Twitchell I owe them all. I commend the combination to my successors in medicine in the full conviction that if used properly by intelligent physicians, I am bequeathing to them what will relieve an immense [amount] of human sufferings in all time to come. This may seem strong language; but, if my experience teaches me anything, it is true."

In his fourth note he wittily alludes to his "romantic" experience with a case of Diaphragmatic Hernia!

"A spice of what I call the 'Romance of Medical Practice' is connected with this pamphlet of seventy-seven pages, and which I prepared, '*con amore*,' and did not know how to publish it until my friend, Dr. J. C. Dalton, the eminent physiologist, saw it in my hands, and begged me to allow him to print it in the *Buffalo Medical Journal*, of which he was Editor.

"The 'Romance' of it is as follows:—In going, with a class of students, around one of the surgical wards of the Massachusetts General Hospital in order to study healthy lung and heart sounds, I observed a young man lying down who had recently received a serious shock from a fall. As

he was not suffering acute pain or apparent distress from the accident, I said to the students, 'I am going to see whether the heart sounds are affected.' On auscultating the left side of the chest, I was astonished that instead of the beatings of the heart I heard nothing but sounds heard as, in the abdomen, of air in the intestines, while the heart was fairly dislocated to the right breast. Jumping too readily to a conclusion, I said, 'As the middle of the back is the seat of the injury, the diaphragm was probably ruptured and the intestines have fallen into the left thorax, and now occupy the whole space usually taken up by the left lung and heart.' Of course it was of great interest to have an autopsy, when the patient died a few days afterwards, but the friend declared it should not be made. Late at night, by the light of a full moon, I entered the window of the autopsy room, and by the same found, what the absence of severe thoracic symptoms ought to have led me to the suspicion of perhaps, but certainly should have prevented my wrong diagnosis, *viz.*, of *recent* rupture of the diaphragm :—I found almost complete absence of the left side of that important muscle. The case interested me very deeply, and I looked in every direction in books and journals, American and foreign, for others similar. Between 1610 and 1846 I could find only eighty-eight cases. These I tabulated according to the 'Numerical Method' of my dear master Louis, and tried to extract from them all the truths they contained, anatomical, symptomatic, and causes; with diagnosis and prognosis as to the duration of life and treatment. I had a most delightful work, away from all the cares of common and professional life. I knew I was doing what had not been before, and I knew that I must necessarily make a compact expression of the truth on the subject which would be worthy of respect and useful to any physician who should meet such a case. In my preface to the pamphlet

(p. 77) that I printed from the Journal I closed with these words, 'I hope that the memoir will be useful to the future student of Diaphragmatic Hernia, but the examination of it can never afford anyone a tithe of the pleasure or profit the original preparation of it afforded me. July 4, 1853.' I could not but feel gratified to read in the London *Lancet,* December 8, 1883 (thirty years after the pamphlet was published) the following allusions to it and to myself. It is contained in an 'Address on the place of Literature in Medicine,' read before the Medical Students' Debating Society, at Owens College, October 22, 1883 (London *Lancet,* December 8, 1883, referred to by *Philadelphia News,* January 12, 1884). The *News* had at the heading of its notice, 'An Englishman's Opinion of some American Work.' The writer of the Address (Dr. Cullingsworth) presents as his motto for the young men before him the noble words of Fichte, *viz.,* 'To this end I am called, to bear witness to the truth. My life, my fortune are but of little moment. The results of my life are of infinite moment, I am a priest of Truth; I am in her pay. I have bound myself to do all things, to venture all things, to suffer all things for her sake.' During the address Dr. C. pays a high tribute to the 'Numerical System.' Of course, the words of a speaker of this high tone gratify me when he says, 'One of the best Medical Monographs with which I am acquainted is on Diaphragmatic Hernia by Dr. Bowditch, of Boston, U.S.A. In this little book, scarcely larger than a pamphlet, is brought together all that, by the most patient research, could be found relating to the subject in Medical Literature during the period from 1610 to 1846. Such work soon becomes intensely interesting, as I can testify from my own experience; and that Dr. Bowditch found it so appears from the concluding sentence in his preface, in which, after expressing a hope that it will be

useful to the future students, he declares '—(here the writer quotes what is given above, the final words of my preface.) Truly the beginning and final outcome of my labour have a touch of the 'romantic' about them. Its commencement was truly such; for did I not 'meet it by *moonlight alone*'? Certainly no lover's heart ever palpitated more strongly than mine did at that hour!"

The last note which I present to you touches upon thoracentesis performed with an exploring trocar and suction pump, a subject and operation which doubtless brought Dr. Bowditch's name into prominence more than any other single work of his medical career. Although numerous papers have appeared on this subject, the following note throws such an interesting personal light upon the obstacles which any reformer has to meet, and has so much pungent satire in its criticisms of those who opposed him at first, that I offer them to you now for your delectation.

"The history of my connection with this operation is as follows: I came from Europe holding the general views of the profession, *viz.*, that it was not to be performed save in most severe cases, and generally when Nature herself was 'pointing,' as in abscess in other parts. But I was led, after a few years of practice and of seeing autopsies at the Massachusetts and Chelsea Hospitals, to believe professional opinion was incorrect. I saw not a few cases of pleuritic effusion end in death, and nothing was found but simple serum filling one pleura and without a trace of disease elsewhere! I said to myself, "Cannot surgery be called to the relief of these sufferers?" I well remember one case, which I was sure was about to terminate fatally if relief were not obtained, and I urged the surgeon (one well known and capable, and willing to be a surgeon in all other cases which were deemed feasible and right by the profession) to plunge into the chest a common trocar and, perhaps, save a life

which otherwise was surely going to perish. He positively declined! After some months this patient died, worn out; and we found the left side of the chest (pleural cavity) stuffed full of simple serum. Not a trace of inflammation of the parts was found, or of disease elsewhere. This case and others like, made a deep impression, but I had no case under my own care. Moreover, I shrunk from surgery, as painful to me. In 1848 I had one patient in my charge as one of the attending physicians at the Massachusetts General Hospital. He had one side of the chest distended, following acute pleurisy. On a consultation held by the physicians and surgeons I was in a minority of one. The others refused. No operation! Death occurred after months of suffering. Soon afterwards, having another case under my charge at the hospital, I determined to ask for no consultation, but to take the responsibility of having the operation of thoracentesis done. And it was done well (as always was the case with Dr. John Collins Warren) by cutting down and making a long incision between the ribs, and all before ether was thought of, so that intense suffering was the result! I said to myself, 'You surgeons must find out some way easier than this, before I shall advise anyone to submit to it.' Meanwhile I was hearing of some few persons operating in Europe with a trocar and cannula, and I determined to advise their use in a subsequent case. In 1849 I saw a child with evident effusion in one pleural cavity. She had had several severe attacks of difficult breathing. I advised puncture, but a surgeon having been summoned, declined to operate, and advised to wait for dyspnœa before doing so! Within forty-eight hours the child suddenly died in another fit of difficult breathing. I was allowed to plunge in a trocar after death, and pure pus gushed out. All these events confirmed my idea that an opening should be made in any case on which I had any opinion to give, and that

the common trocar should be used and not the scalpel. About this period I heard that Dr. Morrill Wyman, of Cambridge (contrary to the advice of the seniors of the medical profession) had operated with the happiest result and with scarcely any pain with an *exploring trocar,* to which he had temporarily attached a strong English stomach pump, which enabled him to draw fluid and, by turning a valve, discharge it with great ease. That was the instrument which I *felt,* although I had not seen it, which combined all that was needed to make an operation a perfect success—powerful, simple, almost painless, and leaving no opening behind when finished! I determined to appeal to Dr. Wyman, though living in Cambridge, as no one in Boston could or would help me. In 1850, April 17, Dr. Wyman operated for me on one of my patients at Woburn. I then made up my mind that I could not always send four miles for a surgeon, and though the act would be very unpleasant to me *I must prepare to operate.* My lessons on auscultation, my 'Young Stethoscopist,' published in 1846-48, had led the profession to think, though a general practitioner, I was interested, especially, in thoracic diseases. I must be prepared to do all that was needed in such cases. The occasion came in October of the same year to test my ability to act up to my determination. A seaman from Wellfleet I found with cardiac disease, but also with one pleural cavity distended with fluid. He had terrible orthopnœa. (I should mention that a short time previously I had had an instrument devised, whereby the cannula could be screwed to the pump instead of with cork as Dr. Wyman had.) So fearful was I, however, of ill success in that simple puncture, that I took with me a young surgeon, a former student and friend of my own. To him I confessed my fear of ill success, and told him that if, at the last moment, I lost courage and bungled at the operation I wished him to

take the trocar and plunge it into the thorax 'capulo tenus.' Fortunately all went well and *I had conquered myself, and was a man.* From that time to this, May 16, 1888, I have operated on 253 patients, and 395 punctures have been made. I believe I have contributed towards the reversal of the opinion of the medical public on the subject of thoracentesis in this country and in England. I feel thankful that I have been able to fight (for it was a fight) against ridicule and contempt of able surgeons of Boston who could not believe that a non-surgeon could teach them anything. This opposition was carried to so great an extent that one of the magnates, two years after the innocuousness of the operation and its great value were acknowledged by most other intelligent and unbiased men of the profession, actually caused the death of a little child, to whom he had called me, by delaying in the room below the little sufferer's, to talk of the 'dangerous' operation. While talking thus, an attendant burst into the room crying, 'For God's sake come up, we fear the child is dying.' We went up instantly, and indeed the last gasp was taken as we entered the room. Thus it is always with Truth—she has to fight her way. My anti-slavery fight has given me some nerve, and this subject of thoracentesis, simple and so beneficent as it seems now, strengthened me still more. I have often in both of these lines of life felt within myself a sort of what old poets would claim a 'divine afflatus,' and when opposition has come I have said, 'You must take it whether you will it or not. It is God's truth!'

"Since those early days it will be seen by those who look into the histories of the various years, that I have been constantly at work upon the subject, and articles have been published by me in America and in Europe, and that I have made it the subject of addresses and communications

to various societies—American Medical Association, New York Academy of Medicine, and Massachusetts Societies, &c. I have in fact never let an opportunity escape of telling what I learned from year to year. My ideas have become widened, and I found out that the operation which I deemed 'mediæval'-like and cruel, *viz.*, cutting down between the ribs, as Dr. Warren did when I asked him to operate, is not only legitimate in some obstinate cases, but that a portion of one to four or five ribs may be taken, and to the real salvation of a patient. That a removal of parts of two ribs is consistent, with the vast advance made within the last few years in surgery, I know is safe. I advised in one case which I think would never have recovered if that operation had not been done. As it happened, nothing but the external scar remained finally to mark the spot, the lung underneath being almost exactly like that on the other side; and no real contraction of the chest was the result. To say that I am not satisfied with this portion of my life-work would be untrue, and yet I see how I was led by a series of circumstances of which I had not apparent control up to these pleasant and humane results. From these operations on the chest many lives will hereafter be saved who without them will die."

My father was never one to dispute with others over priority of claim to any act or deed of his. At every opportunity he acknowledged his debt to Dr. Morrill Wyman, of Cambridge, for the first suggestion of an instrument which in a modified form he used afterwards in hundreds of cases, and forced upon the attention of the medical public. The fact that Dieulafoy, several years later, long after the first published accounts of my father's cases, claimed to be the first to use thoracentesis by aspiration when he introduced his excellent instrument to the world, was an instance of the singular indifference, to say the least, shown

by some Continental members of the profession to the work of their brothers outside of their own country. The fact was one only to cause amusement to my father, and he never attempted to push his claims. It remained for his friend, the late Sir William T. Gairdner, of Edinburgh, who was one of the first to recognize the worth of my father's work, to mention in a memoir he wrote of his friend in the *Edinburgh Medical Journal* of April, 1892, this singular lack of justice as exhibited by the eminent French physician.

Inasmuch as one or two medical papers have within recent years been published in which reference has been made to Dieulafoy as the *inventor* of thoracic aspiration, without any allusion whatever to the exhaustive work of my father upon the same subject years before, I feel I may be pardoned for showing some filial zeal in reviewing the subject again as a matter of justice.

The chief fact remains, and that is after all the best to consider, apart from all personal considerations—thoracentesis has brought relief to thousands of sufferers and saved lives without number. It is hard to believe that such a simple operation as it may be now regarded, to be performed by any practitioner of common-sense and judgment, should have had to be forced upon the attention of a sceptical and prejudiced public of fifty or sixty years ago.

DISCUSSION.

Dr. JAMES M. ANDERS (Philadelphia, Pa.) said he wished only to add a word. The paper was of unusual interest, and to his mind of great historical value, not only as it related to internal medicine and surgery, but also as it tended to show what great leaders in internal medicine thought. The law of Milne Edwards, namely, that function precedes the development of organs in the animal kingdom seems to have been anticipated by the late Dr. Bowditch.

Dr. J. H. PRATT (Boston, Mass.): During the past year I have been studying the influence of Louis on medical thought and practice in Boston. Recently I found in the Boston Medical Library a volume of the collected reprints of Dr. Henry I. Bowditch which he presented to the library with an introduction written in his own hand. In reading these papers, I was impressed with the accuracy of his observations and the care with which they had been recorded. All his writings preserve their freshness in a remarkable degree, and his wise restraint in making deductions and generalizations from the observed facts are everywhere apparent. In this volume is a memoir of Louis. This was printed as a pamphlet by the Boston Society for Medical Observation, and was never put on sale or published in any periodical. Hence it is little known, although it contains one of the most vivid and delightful sketches of Louis ever written. I hope that it will be printed in some journal, so that it may be known and read by all interested in the history of clinical medicine.

I have heard Dr. Osler say that Louis is the patron saint of the Massachusetts General Hospital. His influence was strongly felt by the first physician of the hospital, James Jackson, and by the best of the younger men, among whom Louis had no more loyal disciple than Henry I. Bowditch. It is evident from his writings that to the end of his days he delighted to honour his beloved master. Before the influence of Louis was felt no objective descriptions appear in the clinical records of the Massachusetts General Hospital. There are careful histories, but no notes on the physical examinations. In looking over the early records I found the first volume of Autopsy Protocols. The first autopsy there recorded was made by Dr. Bowditch. It is a model of careful, detailed, objective description, and nothing could show more convincingly how deeply the scientific spirit of Louis had been instilled into his young American student.

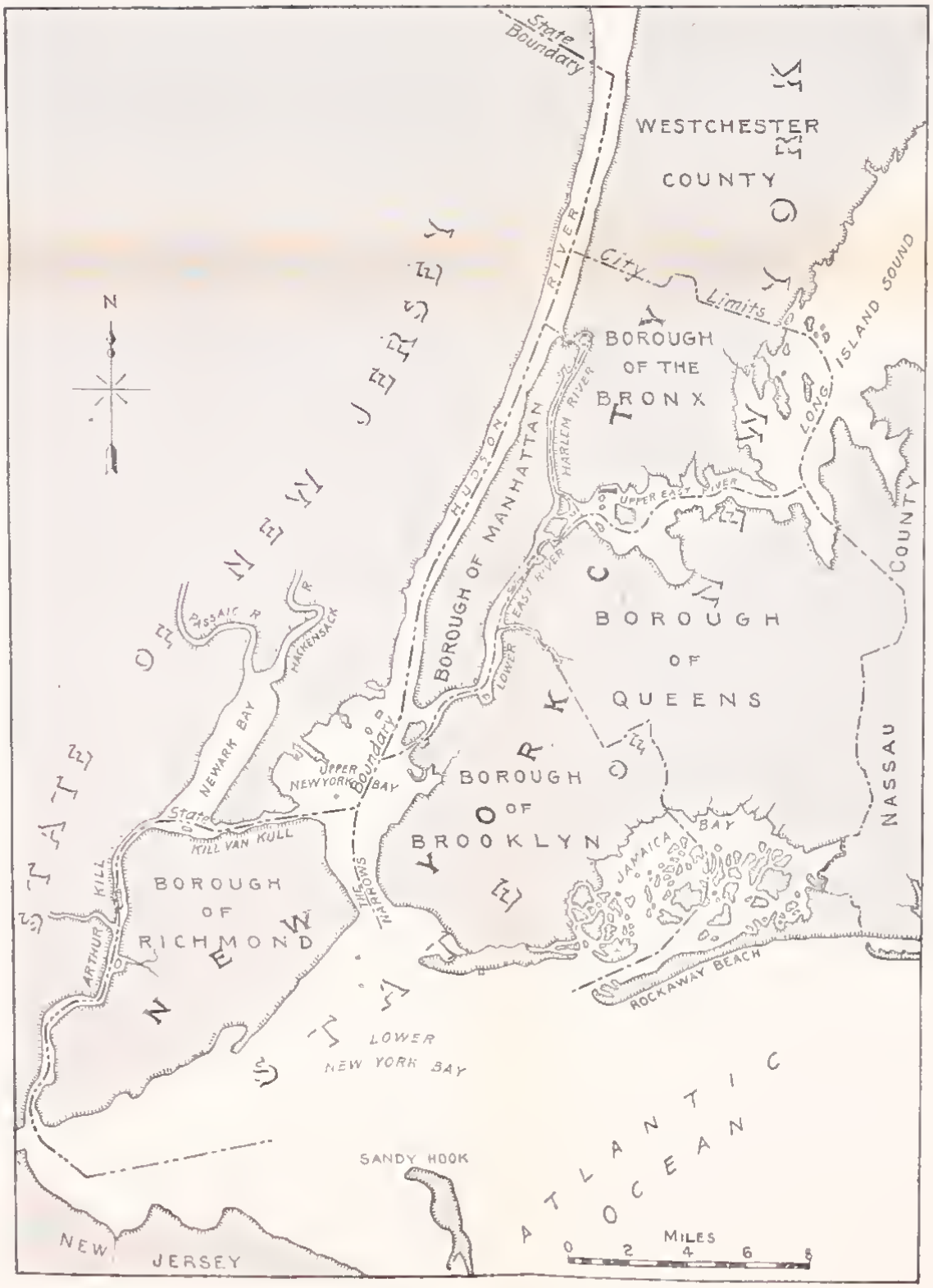
THE POLLUTION OF NEW YORK HARBOUR.

By LINSLY R. WILLIAMS, A.M., M.D.
Member Metropolitan Sewerage Commission, New York.

The New York State Department of Health brought to the attention of Governor Odell, in 1903, the facts: that more and more sewage and factory wastes were being emptied into New York Harbour, and that certain cities of New Jersey, far distant from the harbour, were planning to build an immense sewer to discharge their wastes into the harbour waters of New York.

In 1903 appropriate legislation brought into being the New York Bay Pollution Commission, which continued until 1906, and paved the way for the formation of the Metropolitan Sewerage Commission of New York which, after re-organization, was able to obtain, in 1908, sufficient funds from the City to undertake a thorough investigation of the pollution of the harbour, which Commission has made one full report, in 1909, and whose final reports will be made in 1912 and 1913.

Metropolitan Sewerage District.—One of the Commission's first duties was to lay out a sewerage district, known as the Metropolitan Sewerage District of New York and New Jersey. This district consists of about 568.8 square miles of land, made up of areas of southern New York, western Long Island, and north-eastern parts of New Jersey, the major part of this area being in New York. (See map.)


State Boundary
WESTCHESTER COUNTY
NEW YORK
NEW JERSEY
HUDSON RIVER
City Limits
BOROUGH OF THE BRONX
HARLEM RIVER
LONG ISLAND SOUND
UPPER EAST RIVER
BOROUGH OF MANHATTAN
EAST RIVER
LOWER
BOROUGH OF QUEENS
NASSAU COUNTY
PASSAIC R
HARKENSACK
NEWARK BAY
Upper New York Bay Boundary
BOROUGH OF BROOKLYN
JAMAICA BAY
ROCKAWAY BEACH
State
KILL VAN KULL
ARTHUR KILL
BOROUGH OF RICHMOND
THE NARROWS
LOWER NEW YORK BAY
SANDY HOOK
NEW JERSEY
ATLANTIC OCEAN
N
0 2 4 6 8 MILES

There are also 81.7 square miles of marsh land, and 202.5 square miles of open water.

This large territory is one of the most populous in the world, and contains, beside the five Boroughs of New York City, the neighbouring cities of Yonkers, Mount Vernon, New Rochelle, and White Plains in New York, and Hoboken, Jersey City, Newark, Paterson, Passaic, Elizabeth, Montclair, and the Oranges, and many other smaller cities in the State of New Jersey.

According to the United States Census for 1910:—

Population of New York City	4,766,883
The remainder of Sewerage District in New York State	170,360
Total in District in New York State	4,937,243
Population in parts of five different counties and one entire county in New Jersey	1,487,287
Total for the two States within this district	6,424,530

According to estimates made by the Metropolitan Sewerage Commission and others, the population in 1940 will be somewhere in the neighbourhood of twelve or thirteen million in this area.

Drainage Areas.—The rivers tributary to the harbour waters of New York drain a watershed amounting to 16,021 square miles, about one-half of this being drained by the Hudson River and the Mohawk in New York, and the Passaic in New Jersey. Although there is an enormous volume of fresh land water continually entering the harbour, its total is very small when compared to the amount of sea water entering the inner harbour from Long Island Sound and the Lower Bay with each flood tide.

Amount of Land Water.—The mean annual discharge of land water into the harbour above the Narrows is 26,442 cubic feet per second, or 2,284,588,800 cubic feet per day.

Amount of Sea Water.—The amount of sea water entering the harbour has been measured for each tidal cycle. The flood tide entering the Narrows amounts to 11,665,000,000 cubic feet per six lunar hours, the resultant flow, or the excess ebb, amounts to 1,283,300,000 cubic feet per six lunar hours, about 100,000,000 cubic feet, being part of the flood tide which enters from Long Island Sound and passes down the East River, leaving a resultant flow of fresh land water, seaward, of 1,183,300,000 cubic feet per tidal cycle. So that each outgoing tide contains about ten times more of sea water than land water.

Volume of Sewage.—The actual amount of fæcal matter and urine of human and animal origin which enters the sewers and finally reaches the harbour is enormous. The human fæcal matter is estimated at 625 tons daily. That from horses and mules amounts to about 40 tons daily.

No estimate has been made of the amount of urine.

According to Fuller the fæcal matter amounts to about forty-two tons of dry solid material per annum per 1,000 inhabitants. This dried matter is diluted with water, and the amount of water is, for practical purposes, equivalent to the total water supply. This amounts to about 125 gallons or eighteen cubic feet per capita per day. For the Metropolitan district of New York and New Jersey, using 125 gallons of water per capita per day, the total amount of sewage per day in 1910 amounted to 741,000,000 gallons per day, or 105,800,000 cubic feet per day.

Ratio of volume of Sewage to volume of Water.—The excess ebb passing out through the Narrows consists of 1,283,300,000 cubic ft. per six lunar hours, or approximately 2,750,000,000 per twenty-four hours; in other words, a little more than the ebb for two tidal cycles. The quantity of sewage discharged into the harbour amounts to about 100,000,000 cubic ft. per day, giving a ratio of sewage, not

to the entire quantity of water in the harbour, but to the quantity of water which flows out in each twenty-four hours, of about 1 to 28. In 1940, with the increasing population and with consequent increasing amounts of sewage the ratio will probably be about 1 to 13. The common figure for dilution of sewage entering a stream flowing continuously in one direction is one part sewage to fifteen parts of water. It would therefore appear that the limit for the Upper Bay would be reached before 1940.

Movements of the Water.—As shown in the preceding paragraph, it would seem that there would be no serious difficulty for the harbour to dispose of the present amount of sewage being emptied into it. But in order for the harbour to satisfactorily dispose of the sewage at this ratio, one would have to assume that there was prompt diffusion and that there was a continuous flow of the water seaward. Immediate diffusion is impossible, and a continuous flow seaward does not occur. The disposal of the sewage would also be more satisfactory if all the water which entered at one tide again receded. Such, however, is not the case and there is no direct and immediate flushing of the harbour.

It had been noted for a long time by harbour pilots, that objects floating in the East and North Rivers and Lower Bay did not go out to sea on the outgoing tide, and experiments were made to discover if this were so. Twenty-seven experiments were made in 1907, thirty-nine in 1908, and twenty-five in 1909. Floats were made of cans or spars so constructed that the wind would have as little effect as possible and so that the current which carried them would be not entirely surface current.

The experiments were made in the Hudson, Harlem, and East Rivers, in the Upper Bay, and in Newark Bay and Kill von Kull. The float experiments showed that it took several tides for a float set adrift in the Hudson River

to pass out to sea. They showed that the waters in the Hudson River passed out to sea more quickly than the water in the East River. Floats set adrift in the East River were sometimes taken up twelve hours after they had been set adrift within half a mile of the starting-point. In one instance a float set adrift in the Hudson travelled 187 miles in three days and six hours, and was picked up within a mile of where it was set adrift, having travelled with the ebb current seven times, returning on the flood six times, and traversing nearly all of the water area of the East River from Whitestone Landing to the Brooklyn Bridge. (Map.)

The results of the experiments showed, among other things, the velocity of the various currents in different parts of the harbour, the various eddies in different parts of the harbour, the periods of slack water, the tendency of floating objects to drift towards the shores, and, the most important fact of all, that objects set adrift did not pass out to sea, except after a number of tides.

From this it is inferred that the waters do not pass out to sea, but move in the direction of the Narrows with the flood current, and are partly refreshed by the incoming tide, so that the tide, instead of giving a complete exchange of water, only refreshes it to a slight degree. And from this knowledge the conclusion must be drawn that sewage is disposed of within the limits of the harbour and not carried out to sea.

How is the Sewage disposed of?—Sewage is ultimately disposed of by oxidation, which begins as soon as the sewage enters the water. A demand is made upon the oxygen content of the water so soon as oxidizable material reaches it. A certain amount of solids of the sewage settles to the bottom. This is, in part, mineral matter which is not readily oxidizable and in part organic matter which is easily oxidizable. In the neighbourhood of sewer outlets,

and in the docks and piers and arms of the harbour, and in areas where the currents are slow, the movement of the water is less marked and there is a continuous settling of this organic matter, which almost completely covers the bottom of the Upper Bay.

The Oxygen Content of the Water.—The amount of dissolved oxygen in the water, half sea and half land, should be 6.2 c.c. per litre at 18° C. This may be called 100 per cent. of saturation. If the percentage of oxygen be high, equal to that of saturation, oxidation will take place rapidly and the sewage be readily digested. If the oxidizable matter be continually introduced into the water, part of it is oxidized in the water, but the solid organic matter, which settles to the bottom, forms a thick sludge of ooze, very liquid at its top and with increasing consistency below—but so gradual is the change from water to thick mud that it is often difficult to say just where the bottom begins. This liquid mud undergoes oxidation and makes a permanent demand upon the oxygen content of the water.

If all the oxygen of the water is used up and further demands for oxygen are made, then gases of decomposition are given off, giving rise to continuous bubbles of foul-smelling gas, mainly compounds of hydrogen and sulphur. The water becomes black and greasy in appearance and of unpleasant odour. This condition exists in the Passaic River, in Newtown Creek, Gowanus Canal and in a number of docks and piers along the water front.

If the oxygen content of the water remains high, sewage material will be completely oxidized, but if the charge of sewage in certain localities is high enough to materially diminish the oxygen content, or to cause the continual utilization of all the oxygen, a nuisance will result.

Realizing this, investigations were made of the oxygen content of the water in various parts of the harbour. Two

thousand six hundred and seventy analyses were made, 800 in 1909, and the remainder in 1911. These tests were made at all stages of tide and at different depths. The analyses show that the open ocean and Long Island Sound are completely saturated (map). The Hudson River contains from 70 to 90 per cent. of saturation, the Lower Bay 90 per cent., the middle of the Upper Bay 70 per cent. The lower East River 55 per cent., the southern part of the Harlem River 30 per cent. These were the analyses of 1909.

In 1911, practically the same results were obtained, except that the oxygen content was a little lower. This may be due to increasing pollution, or perhaps to an unusually dry season, causing a diminution in the amount of fresh land water. There was little difference in the oxygen content at different depths, though often a little lower percentage at the surface, about 5 per cent.

In isolated localities, such as Newtown Creek, Gowanus Canal and the Passaic River (map), the oxygen content was practically nil, and in these areas the polluted water is an obvious nuisance.

Renewal of the Oxygen.—The fresh land water, the incoming tide and the atmospheric air each plays a part in the renewal of the oxygen content of the water. Examinations made at the same point on the flood and ebb tides show that the fresher sea-water of the flood contains 10 to 20 per cent more oxygen than the ebb. The Hudson River with its big mass of fresh land water is high in oxygen in comparison to the East River, though other factors add to the pollution of the East River.

The amount of re-oxygenation from the atmospheric air still remains a question for further investigation.

Other Investigations.—It was found by bacteriological analysis that *Bacillus coli* was always present in the harbour

water to the number of 1 to 30,000, by 1,083 analyses of the water in various parts and at all depths.

The examination of the mud on the harbour bottom always showed it to be contaminated with material of sewage origin.

Danger of Continued and Increasing Pollution.—It requires neither imagination nor prejudice to realize that, if the present method of discharging crude sewage into New York Harbour from the ever-increasing population continues, the unflushed-out harbour will become just what some of its grossly polluted and stagnant arms have already become—a veritable open cesspool.

Even now shellfish are still taken from within the harbour limits, but fortunately to a smaller and smaller extent.

Bathing is still allowed by the city authorities in public free floating baths, situated in notoriously polluted places, with danger of typhoid, its allied intestinal diseases and other infections.

An increasing amount of public opinion is being aroused against them and they will soon, it is to be hoped, be either supplied with pure fresh land water or be abolished altogether.

The danger of the harbour's pollution will not continue until it becomes such a nuisance that no ships will enter it, because public opinion is demanding more and more a clean harbour, just as it demands clean streets and good pavements.

How can the Danger be Avoided?—It has been proposed by the Sewerage Commission that the city be divided into a number of drainage districts and that large intercepting sewers be built leading to a purification plant, where the sewage will be treated to a certain extent, depending upon the daily amount of sewage discharged and the volume of water into which it is discharged.

This of course needs a considerable outlay of money, which has hitherto been unnecessary. It has already been deemed necessary at Boston, London, Dublin, and Hamburg, and will soon be necessary for New York, the only hope being that it can be done before any harm is done by delaying it too long.

COLDS AND PNEUMONIA.

By WM. DUFFIELD ROBINSON, M.D.
PHILADELPHIA.

The subjects of colds and pneumonia are of such extraordinary importance that even though little of great value that is new has developed during the past few years, it seems not amiss to place these diseases before this Association for its consideration.

The sum of the days of complete or partial disability properly chargeable to colds is startling to those who have not given it thought. This sum of days lost is estimated to be more than that of all other diseases added together. It also seems trustworthily proven that the money spent in the treatment of colds is more than that spent for the treatment of all other diseases combined. The cost to life must not be overlooked, for to this cause is properly chargeable the inception, directly or secondarily, of a large percentage of diseases which have a high rate of fatalities.

Many cases of pneumonia, tuberculosis, broncho-pneumonia, rheumatism, &c., have only been possible by a preceding catarrhal disease of the breathing highway, usually named "common colds." To passing or permanently reducing nervous and structural resistance of the areas involved in the pathological process of colds is chargeable the invasion of the causes of many systemic diseases and probably malignant and benign growths. If one were to

picture a race of people constantly possessed of normal healthy structures in their breathing passages, they would surely be surprisingly free from many now prevalent diseases.

The maintaining of vigorous health in the membranous regions involved in respiration should be a duty at all ages of life. To attain this, the essentials are cleanliness, avoidance of irritants, and of thermic shocks, and when needed, the use of proper antiseptics. As a preventative and curative, an abundance of clean fresh air, recently laden with that which sunlight gives to it, is Nature's and man's best agent.

A prolonged seance of slow deep breathing will often prevent the development of a cold if indulged in when the first well known symptoms of a cold are recognized. The blood is thus actively and intensely oxygenated, and so all organs excited to vigorous activity, and so Nature's normal defences are raised to being able to prevent the attempted assault by the invading bacteria. If the breathing is done very rapidly without intermission, partial general anæsthesia results, the rapidity of breathing preventing blood oxygenation, and so venous engorgement in the lung capillaries. The condition thus attained is akin to Bier's venous stasis, and such curative results as it affords are secured.

The usual methods of treating colds need no mention here. The following short observations, however, may be appropriate :—

The bacteria causing colds are usually some strain of the same as those causing, or in more or less activity mixed with those which cause, pneumonia. In both diseases, some systemic infection precedes the local lesions.

Colds, especially in the very young and old, lead to the development of bronchopneumonia.

In severe prolonged colds involving the bronchi exten-

sively small areas of bronchopneumonia of central location are believed to be a part of the history. These resolving badly leave points of reduced resistance endangering the invasion of tuberculosis.

In pneumonia, an acid blood is deemed desirable to reduce the coagulability of the blood and to inhibit the multiplication of pneumococci. In colds, if an active alkalinity of the blood is induced early in the history, a prompt termination of the attack is secured. To secure such alkalinity, the skin must be used as portal of introduction, as the stomach could not tolerate the required amount. Two pounds of common carbonate of sodium dissolved in a bath tub full of water at a tepid temperature is the correct strength of solution. In this, the patient is given a fifteen-minute soak. It is free from unpleasant features and is certainly very curative.

It is very generally accepted that a solution of magnesium sulphate applied to erysipelas is very beneficial.

The same micro-organisms which cause colds in different strains cause erysipelas. This suggests the use of this salt in the bath and its addition to the alkaline bath in two pound quantities has proven of marked value. The use of magnesium sulphate internally in purgative doses has long been held in high regard among the laity as an effective medicine for the treatment of colds. Its use would seem to include more than its power of emptying the intestinal tract.

Spraying a 1 or 2 per cent. solution of magnesium sulphate over the naso-pharyngeal membranes is quite an addition to treatment.

The oral administration of 10-grain doses is also of material benefit.

When the respiratory passages are much irritated by a cold, much comfort and assistance towards a cure results from the inhalation of various volatile drugs, including volatile oils. Various devices are on the market for inhala-

tion of such drugs and those which permit of inhalation through both nostrils at the same time are much to be preferred. The drugs most preferred for this use are the volatile salts of iodine, camphor, creosote and its carbonate, menthol, and many volatile oils and their hydrates, separately or in combination.

Ten or fifteen grains of a salt of quinine which actively excites leucocytosis is very effective, especially if given early before there has developed structural changes in the nose, throat, and bronchial tissues.

Bacterines, antitoxins, and the hypodermic use of camphorated oil are likely to steadily advance in popularity.

Pneumonia.

History and description of pneumonia are not a part of this short paper, it being only intended to bring up a number of points of interest resulting from the work and observations of various men, presented with those of the writer.

To refresh the mind on the importance of pneumonia, it may be well to recall that it prevails in every country, climate, and temperature. It is the most frequent and the most fatal of all acute infections which cause death. It causes one-eighth of all deaths, which is more than caused by consumption. Pneumonia occurs over three times as frequently as it did fifty years ago. In much the larger percentage of cases it is caused by the diplococcus of Fraenkel, commonly called pneumococcus. Many other micro-organisms also cause pneumonia, either alone or mixed with the pneumococcus.

It has been shown that pneumonia has been caused by all the disease-producing cocci except the gonococcus, and also by the bacteria which cause typhoid fever, anthrax, plague, influenza, tuberculosis, diphtheria, and by the *Bacillus coli*

communis, and probably several other micro-organisms. They may act separately or simultaneously.

It was long believed that the way in which the alveoli and bronchioles became affected was only by the inspiration of the usual pneumonia causing active virulent micro-organisms into the alveoli. This has not been proven, and in many instances there exists convincing evidence against it. It seems proven that the blood-current is first affected in all cases and the lung tissue secondarily. In some cases, this is surely true, as the lung involvement is secondary to inflammation of other parts by the pneumococcus. General systemic infection may exist ranging from serious results to fatalities with little or no lung development. *This explains why the extent of lung involvement is not to be relied on as a sure index of the seriousness of any case.* Active, virulent pneumococci may be present in the blood-current before any evidence of involvement of any part of the lung can be recognized.

It is believed by some observers that in some instances the highway to the alveoli and bronchioles is not by respiration but by avenues into the blood-current through solutions of continuity in the nasal accessory sinuses. In cases of pneumococcic meningitis, previous infection of the accessory sinuses has been shown to have existed.

Breaks in the nose, throat, and tonsillar membranes are possible portals of entry to the blood-current and so to the lungs.

Some gastro-intestinal inflammations are caused by the pneumococcus, and that avenue has been considered a possible entry way, especially so when the pneumonia is secondary to intestinal disease.

The pain from pneumonia may be far removed from the lungs. This is especially true with children, the pain at times being almost exclusively at any point in the abdomen

and not in the chest. No report of autopsies has been found showing whether or not concurrent intestinal pneumonic infection may have existed about these remote points.

Pneumococci, at times, are the active agents in causing nearly every other disease of the various parts of the body usually caused by the other disease-producing cocci, such as by streptococci, staphylococci, and gonococci. All but the gonococci may cause pneumonia with or without association with pneumococci or other bacteria. A general but as yet unlocalized pneumococcic infection may give rise to severe general pains in the legs, back, and other parts of the body, and later pneumonia may develop or the infection may be eliminated as an active dysentery without the development of pneumonia.

The first physical change in the lungs in pneumonia is a congestion of the capillaries about the alveoli, followed promptly by a clear serous exudate fully dilating the alveoli. Fibrin promptly forms in this, causing solidification. Some observers state that it is not until this time that the active multiplication of the causing micro-organisms begins in the lungs. *The writer has not found any record of the finding of the pneumococcus in the first clear serous exudate, but after the integrity of alveoli has been broken and fibrin has exuded into them, they are found abundantly.*

In animal experimentation on dogs and sheep, which in resistance are akin to man, in pneumonic infection susceptibility, it was not found easy in healthy animals to produce the disease by injecting cultures of virulent pneumococci into the bronchi unless some violence occurred which probably caused some trauma and so solution of continuity in the mucous membrane. Seven of eleven experiments were more or less successful, but the disease produced was broncho-pneumonia. It was likely that later some areas of it coalesced and a true pneumonia developed.

It must be kept in mind that the same organism can produce histologically different diseases, and that identical lesions can be produced by different micro-organisms.

The *Streptococcus pyogenes* strikingly resembles the Fraenkel diplococcus when grown on various mediums. Different strains are distinguished by different characteristics in culture or by different effects produced in animals on inoculation.

Bacteriologists have described transitional forms linking the *Streptococcus pneumoniæ* with the *Streptococcus pyogenes*.

The pneumococcus is extremely rarely found outside the animal body, but is reported by some observers as found in from 20 to 80 per cent. of the mouth, nose, and throat secretions of men in health. Those so found are less virulent in animal experimentation than those direct from active lobar pneumonia. There is much evidence that the pneumococcus is always present in the tonsillar mucosa. It seems quite generally accepted now that the invasion of the blood is a constant accompaniment of pneumococcic pneumonia.

Lobar or broncho-pneumonia is believed to be an extension of a bronchitis or common cold into the bronchioles and alveoli. This is often a mixed infection and often of other bacterial causes than the pneumococcus. Like other infections, the virulence of the organism and the resistance of the subject are the factors that decide the differences in attacks in different subjects. When mixed infections occur, the associated bacteria are usually pyogenic. When streptococci and staphylococci are found with pneumococci, they are believed to be partners in the pathological process, but to what important extent has not been determined, but the mixed infections are the most fatal. It has not been shown that lobar pneumonia produced by

the streptococcus is materially different from the type of pneumonia produced by the typhoid bacillus.

Meningitis, enteritis, pleuritis, pericarditis, urethritis, synovitis, conjunctivitis, and middle-ear infection are some of the infectious diseases sometimes caused by the pneumococcus primarily, or complicating pneumonia. Pure pneumonic infections are not so serious as those by streptococci and staphylococci.

Convalescents from pneumonia, like those from typhoid fever, often carry virulent micro-organisms for many weeks, and so are in danger of being sources of infection. The micro-organisms from those who are recently convalescents are much more virulent than from those who have not had pneumonia.

A simple cold in the head may be due exclusively to pneumococci. The virulence of the bacteria is increased by passing from one individual to another. In acid media and high temperature, the virulence is decreased. This suggests the proper acidification of the blood in treatment as well as the advantage of a reasonable amount of fever.

Immunity from an attack of pneumonia is slight and short, or the attack may increase the susceptibility to another. *The bacterial showing in such cases should be closely studied to learn whether subsequent attacks may not be due to other micro-organisms than the pneumococci causing the first attack.*

Pneumococci grow in normal serum and also in the serum of very recent subjects of pneumonia with equal rapidity, showing that the disease does not leave in the blood any bactericidal substance. It probably does leave an antitoxin to the toxin produced by the pneumonia.

The serum of immunized animals is not effective in checking the disease as would be expected by analogy with other infections. Such serum is not bactericidal. No effective

form of serum for treatment has yet been made. In animals other than man, an autogenous vaccine greatly assists towards recovery. The autogenous vaccine is sure to include all bacteria active in the infection. Miles and Mera report a case of progressive migratory pneumonia yielding only pure cultures of *Micrococcus catarrhalis* and another only *Bacillus coli communis*. The typhoid bacillus is usually found in pneumonia complicating typhoid fever. Schottmüller has reported four cases of lobar pneumonia, in which the only micro-organism he found was *Streptococcus mucosus*. Hastings and Niles have reported forty cases of lobar pneumonia without the presence of the pneumococci in either the sputa or the blood. Leucocytosis is present in all cases of pneumonia, ranging from small counts to over 100,000. Reider claims that the leucocytosis of pneumonia is more a function of the intensity of the infection and the degree of resistance towards the infection than it is of the fever or extent of the exudate. In pneumonia, the chlorides are greatly reduced in the urine, in fact, so much so as to be indicative of pneumonia if other symptoms supporting the diagnosis exist. Near the crisis, if the chlorides again increase in the urine, the outlook is favourable, but the reverse if they do not increase.

Van der Bergh believes that in pneumonia the chlorides remain fixed in the tissues owing to the increase of the products of metabolism in the plasma. The chlorides increase in the expectoration, and the phosphates decrease. The pulse frequency and blood-pressure should keep apace. Any sudden rise of blood-pressure before the crisis implies the onset of some complication, acute delirium often being the immediate following. A sudden fall of blood-pressure is a warning of immediate likelihood of cardiac or, perhaps more correctly stated, vaso-motor paralysis. Failure of the vascular system from toxin or poisons produced is cause of

death. A blood-pressure lower than the pulse rate is ominous of failure of the heart and vascular system.

Non-virulent pneumococci will produce pneumonia in dogs. It is something else than bacteria, probably a reduced resistance, that is the cause of the pneumonia developing. In producing pneumonia in dogs, it is essential that a large amount of the culture be injected into the bronchi, and so leave a sort of cavity beyond which would include the alveoli. In these cavities the bacteria develop causing the disease. Pneumonia starts from many foci, which later coalesce. The conditions beyond the closed bronchioles is different from those existing in the nose, mouth, and throat, and this makes possible the pneumonic development. The foregoing is one of the latest theories of the first start of the disease, but as general pneumococcæmia or other bacteræmia is strongly evidenced as antedating the lung lesion, the theory is probably not well founded.

By some it has been thought that it was the exudate which caused the fever, but the exudate remaining and being absorbed after crisis does not cause fever. No isolated toxin has been procured from the blood or culture from a pneumonic case. The most virulent pneumococci autolyze much more readily than the non-virulent kind. A transition of staphylococci into pneumococci results from passage through the bodies of animals.

Pneumococci are soluble in bile or its salts, and by this solution they become very toxic. The solution depends on the concentration of the bile. This solution when injected kills animals promptly, the right heart being dilated. The production of anaphylaxis or hypersensitiveness is probably due to the splitting of protein of the bacteria. It is not known whether this poison is the cause of the pneumonia or not, but the subject is being carefully investigated.

From the leucocytes which form and break down in pneumonia, a ferment is formed which, when a sufficient amount of it is accumulated in the blood, causes resolution by causing a solution and destruction of the disease-producing bacteria. The number and virulence of the bacteria in the blood play the most important part in recovery, and not the extent of lung involved. It is argued that what is found in the lung is not the disease, but the process of fighting the disease. It is thought that the first capillary encouragement is an attempt to destroy the invading bacteria, in which they succeed often if the bacteria are not very virulent or abundant. The proteolytic ferments normal to animal bodies are the best protectors. In pneumonia the bactericidal power of the blood should be tested. Hirschfelder digested pneumococci in alkaline pancreatic solution, and then slightly acidulated with hydrochloric acid and filtered. This, when injected, gave immunity to dogs against pneumonia for three months.

Something coming from the organism causes the cure in pneumonia. The injection of immunizing substances after all toxin has been removed by autolysis has seemed to do much towards preventing the involvement of more lung and the development of more toxins by the producing of a temporary immunity. Thirty-five consecutive cases of average variety were so treated without a death. Empyema starts from the lung and extends to the pleura. In pneumonic endocarditis first minute hæmorrhages occur in the endothelium and on these the pneumococci or other bacteria grow. Pneumonia kills by paralysis of the vascular system.

Treatment.

But a few words about treatment. Adrenalin hypodermically given and oxygen passed through absolute alcohol are probably the best circulatory sustaining procedures

known. Strychnia properly holds a most important place. Constant outdoor treatment is of first and most importance. Hot baths and copious dilutants to help eliminate the products of the destroyed bacteria and leucocytes are of great value. Always keep the head low. Calomel always as a first medication, and avoid all after constipation. Dry cupping is comforting and of marked assistance. Carbonate of creosote, quinine, salicylates, and large doses of camphorated oil are all of much value in treatment, as is digitalis when taken purely and wisely administered.

Abrams claims wonderful stimulating effects to the failing heart and vascular system by successive vigorous blows on the fingers of one hand which have been placed over the seventh vertebræ by the knuckles of the clenched other hand. To the recurrent stimulating shocks imparted to the nervous supply of the heart, he accredits the results attained.

The yielding vascular system failing to supply blood to the heart can be materially sustained by firm bandaging of the abdomen, so supporting the great vessels.

DISCUSSION.

Dr. J. H. Pratt (Boston, Mass.): If I understood Dr. Robinson correctly he stated that in cases of pneumonia coming to autopsy early in the disease only a serous exudate was found in the alveoli. If this is true a serous exudate would be an œdema of the lungs and not a pneumonia, hence, how could the diagnosis be made? The first stage is called the stage of congestion, but in a search of the literature I was unable to find the record of any early case with the clinical picture of a beginning pneumonia in which congestion was the only lesion. I studied the pathological histology in fifty cases of pneumonia that came to autopsy in the Boston City Hospital. In the earliest case death occurred eleven hours after the onset, the entire left lower lobe except its upper margin was in the stage of red hepatization. The air cells were filled with non-granular cella, lymphocytes and red blood corpuscles imbedded in the mesh-work of coarse fibrin threads.

Dr. W. Duffield Robinson (Philadelphia, Pa.), closing his part of the discussion, said that pneumonia had been produced in dogs and sheep, and then they were killed. During the early stages there was a closure of many of the alveolar structures, and pneumococci were found. Part of the work was done in Chicago and part in Philadelphia.

As to the abdominal binder, it helps in keeping the intestines free from gas. When strychnine and certain other drugs are given they raise the blood-pressue, but this acted as a vasomotor rather than cardiac tonic and stimulant. The patients may be carried through the crisis by this means.

AN EXPERIENCE WITH PROFESSORS HISS AND ZINSSER'S LEUCOCYTIC EXTRACT IN A CASE OF PNEUMONIA.

By HERBERT F. WILLIAMS, M.D.
BROOKLYN, NEW YORK.

In the last year or so it has seemed to me that I have met an uncommon number of cases with hæmic murmurs, and in such varied stations of life that my mind has been called afresh to the significance of these manifestations.

Analyses in all these cases must have shown deterioration in the blood, of course; while in some cases the bruit was co-existent with, or prodromal to a tubercular expression, in others there has been a persistency of these murmurs, which, although not followed by a progressive decline in health, nevertheless has tagged all of my patients with a label so plain that a serious outbreak of some kind has been feared, and in one case such an outbreak occurred. It was my experience in this case that made me feel that I might report something of value to this meeting.

The hæmic murmur in this case supervened after months of anxiety over an infection and re-infection of typhoid in the wife. Then followed the serious illness of a child. This condition was discovered in the father, a man of 35 years of age, whose metabolism had been necessarily disturbed. In this condition he was seized with a lobar pneumonia of great severity. On the second day, the murmur which had been confined to the subclavians, extended to many regions of his frontal chest, and possibly elsewhere. I do not remember

ever having seen or hearing of just such a case. Upon slight exertion, like turning or coughing, there would appear an extra blow from the original site, which was unusually loud and portentous. This sudden accession in the number and intensity of these murmurs was interesting as well as disquieting. I conceived the cause to have been the quick withdrawal of sufficient blood to make the hepatizing area of the lower lobe of his left lung. If this is correct, we might, perhaps, more closely reason as to the exact mechanism by which these sounds are produced. Certainly, I have never been entirely satisfied as to the explanation of the cause of many of these murmurs, which have been classified as inorganic. The pulse, temperature, colour—in fact, the full clinical picture of this case was that of great severity, and one in which an early central toxæmia seemed imminent.

With a sense of the inadequacy of the measures heretofore used to prevent an alarming toxæmia, and the well-nigh hopelessness to combat it if developed, I decided to rely upon Professors Hiss and Zinsser's Leucocytic Extract. Doubtless many of you are familiar with the early reports of its curative action in various acute infections. Their first report, including a record of seven cases of lobar pneumonia, appeared in the November, 1908, number of the *Journal of Medical Research*, and I am informed that a further report will soon be published.* In the report of these seven cases of pneumonia, well-known men in New York were the observers, including William Hanna Thomson and S. W. Lambert. However, it was not this report alone which induced me to use the Extract in what I know was my desperate case, but rather the verbal report of a still more desperate case by my friend, Dr. Laing, of Brooklyn, who described the condition of a nurse in the German Hospital of our city, where the entire medical staff gave a fatal pro-

* *Journal of Medical Research*, xx, p. 245.

gnosis, and where Dr. Dwyer, Professor Hiss's clinician, reluctantly consented to try the Extract in so hopeless a condition. Unexpectedly to him and to everyone who had watched the case, a recovery was made. This was the determining factor in my decision. To my mind the conditions of my case made it as certain as the occurrence of any published event, that my patient was rapidly falling into a severe, if not fatal, state.

Dr. Dwyer came and gave the first injection of 10 c.c., which I followed by a second in a few hours. In twenty-four hours—that interval for the period of beginning delirium in such cases—there was a marked contrast from anything I have ever observed in cases of such initial severity. Without offering any explanation as to the cause (unless it be found in the tonal effect of the extract upon the walls of the blood-vessels), I assert that the extensive hæmic murmurs of the day before had markedly decreased. The temperature, pulse, and general morale of my patient had so changed for the better that I felt I was dealing with a simple case of pneumonia with negligible symptoms. As a precautionary measure the injections of 10 c.c. were continued twice daily until 90 c.c. in all was given, and this was the more necessary because of subsequent creeping character to the inflammation, which was in itself a further evidence of the virulency of the bacillus with which my patient became infected.

The case went on to recovery with only some slight delay in resolution, such as his pre-pneumonic conditions imposed.

Now, "one swallow does not make a summer," but a conjunction of thunder-storms from which these birds of rapid flight are quick to seek shelter, seems to me to afford a most conclusive proof that my patient was like one of these birds, which realized that one danger or many must be avoided before the storm rages in all its fury. Thus I

advise all my hearers to watch for further reports of this highly scientific product—Professors Hiss and Zinsser's Leucocytic Extract.

DISCUSSION.

Dr. CLEAVELAND FLOYD (Boston, Mass.) said that three years ago he had the pleasure of seeing some of the work done in New York with Hiss' Extract. Dr. Lucas and Dr. Floyd had treated thirty cases of pneumonia at the Massachusetts General Hospital with leucocytic extract, and many of these patients were alcoholics. He did not remember the effect upon hæmic murmurs, but the mortality was lowered to 12 per cent., as compared with the general mortality of 20 per cent. In this group of cases the results of this treatment were very striking. They then tried it in a number of cases where there was a general infection with localization in the lungs, and no results were obtained whatever. One striking case occurred in a child with signs of pneumonia and signs of infection of the pleura, and all cleared up after several injections of the leucocytic extract. He agreed with what Dr. Williams had said, and looked forward for further reports.*

Dr. J. H. PRATT (Boston, Mass.): There are two medical services with an equal number of beds at the Massachusetts General Hospital. Dr. Floyd treated the cases of pneumonia on one service with the leucocytic extract. The mortality, as he has stated, was very low. But on the other service that year, I have been told, the death-rate among the pneumonia cases was equally low, although the leucocytic extract was not used. Dr. Floyd will correct me if I am mistaken.

Dr. CLEAVELAND FLOYD (Boston, Mass.) said that, in answer to Dr. Quimby, there were thirty cases, and twenty-seven of these were distinctly cases of lobar pneumonia and three broncho-pneumonia occurring in children with severe infections.

In answer to Dr. Pratt's question, all the cases were treated on one service. The mortality on the hospital service on which the extract of leucocytes was not used he did not know.

During that winter the cases that occurred outside the hospital had a mortality that was very high. There were a number of cases that presented an infection that was general. They all realized that the mortality-rate in pneumonia changed from year to year.

Dr. HERBERT F. WILLIAMS (Brooklyn, N.Y.) closed the discussion. He said he wished to have it understood that those were desperate cases and not hospital cases cases that were well-nigh hopeless. The giving of 10 c.c. of fluid into the subcutaneous tissues was a painful operation and, therefore, he used a hypodermic of morphine or a local anæsthetic.

* "A Study of Leukocytic Extract and its Action on the Course of Pneumonia." Floyd and Lucas. *Trans. Association of American Physicians*, 1900, p. 167.

SOME REMARKS ON THIRTY ODD YEARS OF CONTINUOUS CLIMATIC OBSERVATION IN ATLANTIC CITY.

By PHILIP MARVEL, M.D.
ATLANTIC CITY, NEW JERSEY.

The importance of climate in the question of public health is no longer a subject for discussion; it is a matter of state and national concern. Every nation interested in economic government recognizes the vital importance of accurate knowledge concerning the climate of its territorial domain; and each, in a way, is competitively striving with the other to obtain greater scientific data with which to specially benefit its people in the preservation and maintenance of good health.

Neither nation nor state can afford to ignore the required physical necessities of its subjects when, to do so, means to enfeeble, and otherwise disable, its subjects. More important than money are healthy men and women whose vitality and labour mean increasing power and assets in the nation's wealth. To be able to hand to the ill and unfortunate, climatic data with comparative conditions in various parts of one's own country, ofttimes means that the Government has put within that individual's possibilities a locality where he may win bread and health for his family. Thus provided, a state or nation may easily advise a helpful change which, when intelligently selected, becomes greatly advantageous to

the individuals concerned, and to the community to which the change is made.

The most important factors of climate in any locality are temperature, humidity, sunshine, velocity of the wind, and precipitation (inches of rainfall). It is true there are relative and incidental factors that may occasion local disturbances, but these are always more or less conditional, and in no wise vital when considered alone.

These facts, together with a personal interest in a comparative study of the weather changes in Atlantic County and City with those of other cities similarly located, led me to look into the subject; and, finding the result of my study a great surprise, as well as of much interest to me, I venture to record a brief abstract of the same, feeling that it will be of more than passing interest to others of our Association. For the data, I am indebted to the official records and to the assistance of L. A. Judkins, Section Director of the U.S. Weather Bureau of Atlantic City. The reports, as herein arranged, conclusively show that this city possesses a most favourable climate, for its latitudinal situation, whether the subject be viewed from any one, or all, of the several fundamental factors previously referred to, *viz.*, temperature, humidity, sunshine, velocity of wind, precipitation, &c. Altitude has no particular part in our report, except for the purposes of comparison.

The most important climatic features of this celebrated seashore resort, modified as they are by the peculiar physical conditions of the soil and atmosphere, are the comparative mildness of the winter season, the coolness of summer, together with the abundance of sunshine throughout the year, and the general exemption from heavy snows, with comparatively few fogs.

Atlantic City has an average winter temperature of 34°, the normal for the coldest month, January, being 32.5°.

The summer temperature averages 70.5°, with July and August, as a rule, furnishing the warmest weather. The normal temperature for spring is 48°, and for autumn, 57°. The annual mean temperature is 52°. For purposes of comparison, the average winter and summer temperature of several of the large eastern cities are herewith given :—

	Winter	Summer
Boston	29° F. ...	69° F.
New York	32° F. ...	71° F.
Philadelphia	33° F. ...	74° F.
Baltimore	35° F. ...	75° F.
Washington	34° F. ...	75° F.
Pittsburgh	32° F. ...	73° F.

Figures sometimes fail to adequately describe the conditions or circumstances to which they are applied, and it is proper to say in this connection that there are many days in winter with seemingly low temperatures that are a delight to the Atlantic City visitor because of the fact that the sun-streamed Broadwalk is a number of degrees warmer than the figures representing the shade temperature. On the other hand, the heat of summer is nearly always tempered by the refreshing and cooling south-west breezes, blowing directly from the broad expanse of the ocean. The only wind directions that produce excessive heat in summer are west and north-west, and these are infrequent. The average number of days in Atlantic City with a summer maximum temperature of 90°, or higher, is only two, as against from about ten to twenty such days at places in the interior. The highest temperature on record for the city is 99°, this having occurred twice since the year 1874. During the period 1874-1911, there have been five years with the highest annual temperature less than 90°, and twenty-seven years with less than 95°. The lowest temperature for Atlantic City is 7° below zero, this having been recorded once in December (1880) and on two successive days in February (1899). The average number of days per year with minimum temperature

32°, or below, is 84, and with zero, or below, 1. There have been twenty-seven years since 1874 without zero temperature, and the actual number of days, 1874-1911, on which the temperature has fallen to zero, or lower, is only twenty-one.

The several seasons of the year are occasionally subject to marked departure from their normal weather elements, but, with respect to temperature, the comparative equability of Atlantic City's climate is well illustrated by the fact that the warmest and coldest seasons on record have not been excessively above or below their respective averages, and only slightly so in a few instances.

The mean temperature for the warmest and coldest winter, spring, summer, and autumn, with the departures from the normal temperature, are as follows:—

	Mean temperature	Departure from normal
Mildest winter	42° F.	+ 8° F.
Coldest winter	29° F.	− 5° F.
Mildest spring	52° F.	+ 4° F.
Coldest spring	44° F.	− 4° F.
Warmest summer	72° F.	+ 1.5° F.
Coolest summer	69° F.	− 1.5° F.
Warmest autumn	60° F.	+ 3° F.
Coolest autumn	53° F.	− 4° F.

It will be seen that the average temperature of the warmest summer on record was only 1.5° above the normal, and that of the coldest winter 5° below the normal.

The average date of the last killing frost in spring is April 11, and of the first killing frost in autumn, November 4. The earliest date on which a destructive frost has occurred in autumn is October 1, and the latest date in spring, April 25. The earliest date on which freezing temperature (32°) has occurred in autumn is October 10, and the latest in spring, April 30.

September and October, with average temperatures of 67° and 56°, respectively, are, ordinarily, two of the most pleasant months of the year, on account of their moderate

temperature, the large amount of clear weather, and a marked decrease in the humidity that is present in the midsummer months.

It is a popular, but in the opinion of the Weather Bureau officials an erroneous, supposition that the Gulf Stream exerts a marked influence on the climate of the New Jersey seacoast. This ocean current is distant 100 miles or more from the New Jersey shore, and although its temperature is somewhat higher than that of the surrounding water, there is hardly a possibility that the stream has any perceptible or marked effect whatever on the climate of this locality. The comparative mildness of the winter season is due to the influence of the latent heat of the ocean itself, rather than to that of the Gulf Stream alone.

The temperature of the ocean at Atlantic City is exceptionally favourable for bathing in summer. In the summer of 1911 the surface water temperature rose to above 70° in the latter part of June, and was not below 70° thereafter during the season, except occasionally and briefly in July. The water temperature was 80°, and slightly higher numerous times in August, and remained above 70° until about October 1.

The average precipitation (rain and melted snow) at Atlantic City is 40.82 in. The precipitation is quite uniformly distributed through the several seasons as follows: Winter, 10.41 in.; spring, 9.72 in.; summer, 11.11 in.; autumn, 9.58 in. August, with an average of 4.30 in., is the wettest month. There are four months, April, May, June, and September, that are classed as dry, each having an average rainfall close to 3.00 in. The average annual number of days with measurable precipitation is about 125, the greatest annual number on record being 143, and the least 101. Virtual immunity from heavy snowfall during winter is one of the several climatic characteristics that

attract many winter visitors, whether bent on pleasure or seeking restoration of health. That the resort escapes in large measure the heavy snowfalls that are common to the interior is accounted for by the simple fact that, when conditions are opportune for snow, the temperature often tends upward with the approach of the storm centre, thus frequently changing the precipitation to rain. The average annual snowfall is only 18 in., and the average number of days with snow (November to April, inclusive), twelve. The normal amount for the three winter months is about 13 in., January and February naturally having the heaviest falls. Snow is infrequent in November, and there have been so few appreciable amounts in April in the past thirty years that the average for the latter month is merely a "trace." It is uncommon for snow to remain on the ground for any considerable time; on the contrary, it often disappears within twenty-four hours after ending.

Atlantic City is abundantly supplied with sunshine—an important climatic feature. The average annual number of hours of sunshine is 61 per cent. of the possible 100. The averages for the summer months range from 63 per cent. to 68 per cent.; September has an average of 67 per cent., and October 63 per cent. Less sunshine is present in winter than in summer, but each winter month has an average percentage exceeding 50, that for December being 55 per cent., for January, 52 per cent., and for February, 60 per cent. No winter month in the last sixteen years has received less than 40 per cent. of the possible amount of sunshine, and several winter months have had as much as seven-tenths of the possible number of hours. The average cloudiness (scale 0 to 10), is 5.0. The average number of clear days per year is 122; partly cloudy, 135; cloudy, 108. Two hundred and fifty-seven (257) days mostly sunshine is a fact for comment in this latitude. South and south-west winds prevail from

May to September, inclusive, and north-west winds predominate at other times, though by no means are they continous—there are frequent southerly sea breezes.

The foregoing statements imperfectly cover the subject of the climate of Atlantic City in a very general way, and it must not be inferred from them that agreeable weather is always to be found here. Although the records prove, beyond doubt, that the sum of the good qualities of the climate largely outweighs the unpleasant conditions that are encountered in this city, disagreeable weather will be met here at times as well as elsewhere.

Owing to the difference in temperature, humidity, sunshine, &c., observed in the northern and southern sections of our State, as well as in adjacent localities, it doubtless will be of interest to discuss briefly some of these differences as the probable reason for their occurrence. If we draw an imaginary line from the east coast of the Atlantic Ocean south of Sandy Hook, through Newark Bay, west to the east bank of the Delaware River at Trenton, we divide the State into its so-called northern and southern divisions; the former, like the annexed portion of Pennsylvania and New York—though in each case separated by large streams of water—is mostly hilly or mountainous, and has an underlying clay subsoil with an abundance of shale and trap rock; the latter, bounded east, west and south by the Atlantic Ocean and its tributary, the Delaware Bay and Delaware River, is composed chiefly of alluvial and sandy soil, undulating and sloping eastward and southerly to the coast. The average temperature difference between the northern and southern portions of the State is recorded at 8° F., but this in no wise conveys an accurate idea of the variations which are ofttimes experienced, and which in certain weather is not uncommonly twice as great.

The mean annual difference in temperature between

these sections has given rise to many discussions, and observations respecting these facts have been the subject of much speculation, resulting in a more or less general acceptation of the Gulf Stream theory, which attributes all favourable differences to its presence in the near vicinity. Whatever scientific truth there may be in this part of my subject, I shall leave it to the United States Weather Bureau, and to those deeply interested in this aspect of the question to determine, and will dismiss it, with the further reference that no solution that omits a proper consideration of the physical condition of the atmosphere and soil, together with the geological formation, and the vicinity influences of the large body of salt water can be considered in any way an important or final answer to the query.

Certain it is that the season extending from early June to early October is one in which the temperature of the atmosphere is most of the time higher than that of the ocean, and from the latter month until the following May, with few exceptions, that the temperature of the ocean is higher than that of the atmosphere. Herein no doubt lies the greatest reason for the modification of our seasonable climate, and especially for our cool summers and comparatively warm winters. True, all of this former period, namely, from June to October, the ocean is extracting from the atmosphere heat, after which time when the temperature of the atmosphere is less than that of the ocean, this great body of water gives up its latent heat in its attempt at temperature equalization.

The differences in the relative humidity and precipitation no doubt are to be found in the differences in the soil observed in the two sections, that of the north being practically of clay formation, which prevents rapid filtration and easy evaporation, whilst that of the southern section,

being largely alluvial and sandy, permits of the most rapid percolation and slight evaporation. However wide of the truth these citations may be, the fact remains that there are greater climatic differences to be experienced between these sections, than have been above referred to, and indeed quite sufficient to the closely observant to conclusively prove the fallacy of the sometimes stated "non-climatic influence in the restoration of health."

Whilst air is a comparatively staple mixture, it may be more or less influenced in its composition by locality, and frequently becomes the vehicle in which multiple disease and poisons are transferred. Then, again, too much or too little precipitation may become a menace to the healthful, as well as to the ill, as relative humidity is as essential to good health as are other normal physical elements of the atmosphere. Of no less importance than humidity is sunshine, and mild wind currents; the latter keep the atmosphere astir and are active in transferring from the body the superfluous heat and toxic elements.

It also seems important that I should record just here that the atmospheric pressure at sea-level is about 16 lb. to the square inch, and the normal number of respiratory movements are about the same number per minute. Naturally enough both these conditions change as one ascends into a more rarified air, the former lessening and the latter increasing, resulting in greater lung expansion and the quickening of the peripheral circulation. Whilst these facts considered by themselves at once suggest a lessened amount of work for the poorly compensating heart in the more rarified air, we must not lose sight of the fact that in most cases where non-compensating cardiac action is present, the tonic stimulating influences of the sea air to a greater or less extent compensates for the increased lung expansion and the free capillary circulation, and not infre-

quently proves as satisfactory an assistant in the re-establishment of better or normal compensation as does rarified or mountain air. But in this, unfortunately, I know of no governing rule. Only a trial is sufficient in some cases to prove which is the better suited to the subject. The explanation is such an involved one, entering into that of physics, chemistry and autogenetic forces, that it becomes too complex for any explanation here.

By this reference it is not my purpose to particularize any class of diseases which are especially benefited in this climate, except to refer to certain infections, as others have already written much on this aspect of the subject; rather to emphasize the fact that almost all convalescents may be directly benefited by sea air—whether they be convalescing from acute or chronic disease. This is especially true when similar or greater advantages to what they have been accustomed may be obtained. A too radical change, except in a very small number of cases carefully selected, is never advisable, hence knowledge and some caution should be exercised in changing any patient, and most convalescents, from one climate to another, and to see that in the environment sought, too great a number of bodily comforts are not exchanged for atmospheric advantages alone. The same therapeutic rule "of the necessity of knowledge and use of good judgment" should guide in this as in all other decisions which are intended to be helpful and healthful for the sick.

The question of accommodation in Atlantic City is too well known to permit of reference, except to state that it is obtainable by all classes—such as will meet the requirements of the very feeble and delicate as readily as those of the sturdy and strong, no expense having been spared by the greater number of hostelries to make the accommodation consonant with the particular necessities demanded and benefits to be derived.

Infections are notably less prevalent at the sea-shore, milder in form and shorter in the period of invasion, than is observed inland and in large commercial cities; this is especially true when the physical comforts are comparable with the climatic advantages. Pneumonia *per se*, is rarely observed in Atlantic City. When seen here it is usually in complication with some other form of infection, and most frequently of the bronchial type; even the latter is comparatively rare, estimated on the basis of the City Hospital statistics. The same is also true of various other forms of infectious diseases—grippe, tonsilitis, whooping-cough, influenza, &c. The rarity with which these are associated with pneumonia, endocarditis, pleurisy, sinusitis, synovitis, &c., is no less than remarkable compared with similar cases in the larger cities, and chronic sequelæ are little heard of, where cases are properly observed through the convalescing period; all of which is particularly strong in affirmation that the physical properties of the atmosphere and the relative advantages of the climate of this locality must be, in some measure, both protective and prohibitory.

For an all-the-year-round climate, Atlantic City may rightfully boast that there are few, if any, to equal it, and none, in every respect, superior to it. Hence to those with weary brains, tired muscles or lagging functions; to those with a tally of years that forces withdrawal from the more demanding business activities; those on whom disease or accident has laid its afflicting hand not too heavily; and also to those slow of convalescence because of constitutional reasons, or psychic disturbances, whether youthful or aged, I recommend the Atlantic City climate—to none as a perfect panacea, but to all as a helpful adjuvant in relieving most ills.

PNEUMONIA IN OPEN-AIR SANATORIA.

By HARRY LEE BARNES, M.D.
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It has been a common belief among sanatorium physicians that croupous or lobar pneumonia occurs less frequently among tuberculous patients in open-air sanatoria than among the general population. It has also been a common belief that exposure to cold causes an increase in the incidence of pneumonia. To present facts which shall allow us to judge of the accuracy of these apparently conflicting views is the object of this paper.

To learn the incidence and mortality of pneumonia in open-air sanatoria, blanks were sent to all members of the American Sanatorium Association asking for reports of cases of pneumonia, a statement as to age, sex, type of pneumonia, presence of a crisis and termination. The results of this inquiry follow in tabular form.

From the following table it will be seen that statistics from twenty-nine prominent American and Canadian sanatoria were obtained and that thirteen cases of croupous pneumonia with five deaths from this cause were reported. Forty-two cases of broncho-pneumonia, with sixteen resulting deaths, were also reported. Several sanatoria failed to report on broncho-pneumonia, so that the statistics are not entirely complete on this point.

Of the thirteen cases tabulated as croupous pneumonia the symptoms and physical signs were typical. A crisis was present in all cases which recovered, except one. No cases were included which were immediately preceded by hæmoptysis. In five cases rusty sputum was recorded, there being no record in the other cases. In eight cases the

TABLE 1.

Name	Treatment days	Lobar Cases	Lobar Died	Bronc. Cases	Bronc. Died
Adirondack Cottage San.	755,550*	0	0	no record	
Agnes Memorial, Denver, San.	266,450*	1	1	5†	5
Army U.S., New Mexico, San.	396,497	1	1	4	4
Battle Hill San.	21,282	0	0	0	0
Crane, Rutland, Mass., San.	5,190	0	0	1	0
Gaylord Farm, Conn., San.	161,866	0	0	3	2
Iowa State San.	109,500	0	0	0	0
Laurentian, P.Q., Canada, San.	11,447	0	0	0	0
Maine San.	125,000	0	0	0	0
Mass., Rutland, San.	374,490	2	1	17	3
Maryland State San.	184,506	1	1	0	0
Michigan State San.	73,000	0	0	0	0
Minnewaska San.	21,330	0	0	0	0
Montefiore Home, N.Y., San.	480,000	0	0	no record	
New Hampshire State San.	28,648	1	0	0	0
New Jersey State San.	174,386	0	0	0	0
New York State, Ray Brook, San.	374,108	0	0	0	0
North Reading State San.	138,815	0	0	1	0
Oil City, Pa., San.	27,375	0	0	0	0
Pottenger, Monrovia, Cal., San.	292,000	6	0	4	1
Provincial, N.S., San.	12,633	0	0	1	0
Reception Hospital, Saranac Lake	55,183	0	0	no record	
Rhode Island State San.	245,285	1	0	1	1
Sharon, Mass., San.	113,880	1	1	0	0
Stony Wold, San.	225,247	2	0	0	0
Vermont San.	47,658	0	0	0	0
Virginia State San.	35,770	2	0	0	0
Westfield State San.	93,184	1	0	4	0
Wildwood, Conn., San.	107,310	0	0	1	0
Total	4,957,590	13	5	42	16

* Estimated.

diplococcus pneumoniæ was found, no record being obtained in the other cases, and in one case the diagnosis was confirmed by autopsy. If the diagnosis of croupous pneumonia is warranted by the clinical findings, it would seem to have been warranted in these cases.

Reports on pneumonia among employees were received from nineteen sanatoria, covering 893,601 days, which is

equivalent to observation on 2,448 people for one year. Two cases were reported from the Gaylord Farm (Conn.) Sanatorium and one from the Rhode Island State Sanatorium. All three were typical clinically, terminating by crisis and recovery. At least two had rusty sputum. The diplococcus pneumoniæ was found in the Rhode Island case and not sought for in the others. Employees in open-air sanatoria live a hygienic and open-air life which is far above that of the general community, and second only to that of the patients themselves. The number of observations on employees, if not sufficient to compute a rate of incidence, at least tends to support the diagnosis of true croupous pneumonia among the patients, as it shows that open-air sanatoria confer no immunity against this disease among the healthy.

The number of treatment days covering the time reported on was 4,957,590, which is equivalent to observation of 13,582 people for one year, the five deaths from croupous pneumonia giving a mortality rate of 36.81 per 100,000 of sanatoria population.

Bulletin 109 of the U.S. Census for 1910 gives the population of the registration area as 53,620,262, and the number of deaths from lobar pneumonia as 24,972, which is equivalent to a mortality rate of 46.5 per 100,000 population, or somewhat more than that of sanatoria. As only 36.6 per cent. of all deaths in the general population occur between the ages of 10 and 50, and as practically all sanatorium patients are between these two age limits, we can roughly compute the expected sanatorium death-rate to be 36.6 per cent. of that of the general population, or 17 per 100,000 population, or that the deaths reported should have been only 2.3 instead of 5. While this supposes the age distribution in sanatoria between the ages of 10 and 50 to be the same as that of the general population, and is therefore not exact,

it should not vary sufficiently to materially affect the result. The fact that most sanatoria are located in the country where the pneumonia death-rate is lower than in cities also tends to make the sanatorium death-rate appear high.

One defect in the foregoing computation is that a large proportion of all pneumonias tabulated in Census returns, are classified as "Pneumonia undefined." In the Census of 1910 there were 29,215 cases so tabulated against 24,972 for lobar pneumonia. Doubtless there is a considerable proportion of these cases which are really lobar pneumonia, but as only 23.2 per cent. of these cases are between the ages of 10 and 50, it could only to a slight extent account for the discrepancy between the mortality from lobar pneumonia in sanatoria and in the general population. A more important consideration is the raising of the pneumonia mortality in sanatoria because of the previous crippled condition of the lung on account of tuberculosis.

It should be noted that five of the thirteen patients having lobar pneumonia died, giving a death-rate of 38.4 per cent. of the cases, or nearly twice the ordinary death-rate. As the mortality per 100,000 in sanatoria is nearly twice that of the general population, the incidence of the disease should be about the same in the sanatoria as in the general population.

The impression that lobar pneumonia is rare in sanatoria for tuberculosis results largely from the limited population which the physician has under observation. If in a sanatorium of one hundred beds the physician does not see a case oftener than once in fifteen years, it seems rare to him, but this rarity is normal when deductions are made for the small population and the fact that the patients are at age periods which furnish only 36.6 per cent. of all cases of lobar pneumonia in the community.

The death-rate from all forms of pneumonia for the registration area in 1910 was 147.7 per 100,000. As only 22.3 per

cent. of the normal death-rate for all forms of pneumonia occurs between the ages of 10 and 50, the sanatorium death-rate for all forms of pneumonia may be estimated at 22.3 per cent. of 147.7 or 32.9 per 100,000. According to the reports received it actually was 213.51 per 100,000. Aspiration pneumonia, following hæmorrhage, unquestionably accounts for a good part of this excessive total of all forms of pneumonia in sanatoria.

Summary.

(1) Twenty-nine sanatoria for tuberculosis, from records equivalent to observation on 13,582 patients for one year, reported thirteen cases of croupous or lobar pneumonia with five deaths, or a mortality rate of 36.81 per 100,000 population.

(2) The mortality from lobar pneumonia in the United States registration area Census of 1910 was 46.37, and if allowance be made for a different age distribution in sanatoria from that of the general population, the death-rate for lobar pneumonia in sanatoria should be about 16.97 per 100,000 population.

(3) Thirty-eight and four-tenths per cent. of the cases of lobar pneumonia died, the high mortality probably being due to preceding tuberculous disease.

(4) If allowance be made for the high mortality rate of the cases and for the underrating of lobar pneumonia in the Census due to "pneumonia undefined" reports, it appears likely that the incidence of lobar pneumonia is about the same in sanatoria as in the general community.

(5) The total death-rate from all forms of pneumonia in sanatoria is 213.51 instead of 32.9 per 100,000, as would be expected, the excessive death-rate being largely due to aspiration pneumonia.

(6) The impression that lobar pneumonia is rare in sanatoria for tuberculosis is due to the small population

under observation and to the fact that sanatorium patients are at ages which furnish but 36.6 per cent. of the lobar pneumonia cases.

(7) This investigation furnishes no evidence that the incidence of lobar pneumonia is influenced by the open-air life in sanatoria. Were the population of the world put on the open-air *régime* at all times and seasons, it does not appear that the incidence of croupous or lobar pneumonia would be materially increased or diminished.

DISCUSSION.

Dr. LAWRASON BROWN (Saranac Lake, N.Y.) said that it was not an easy thing to make a diagnosis of pneumonia when the patient was afflicted with pulmonary tuberculosis. The mere finding of the pneumococci did not prove anything; they were found in a great many patients who did not have pneumonia. He believed the diagnosis to be very difficult, and he questioned whether the diagnosis was really ever made except at autopsy or when the crisis occurred. He had seen several cases in which pneumonia was suspected at the sanatorium where he had been for twelve years. Following a hæmoptysis one did get an involvement of an entire lobe sometimes, and occasionally this cleared up, but it would be difficult to say positively that this was a case of lobar pneumonia. He expressed a desire to hear the details of the cases reported to Dr. Barnes by several of the gentlemen present.

Dr. MORRIS MANGES (New York) said there were two statements that had been made that deserved comment, and these pertained to the treatment.

As to the question of the head being kept low in pneumonia, he asked how it could be done and what advantages did such a position offer.

He asked what would be gained by placing a tight binder around a patient suffering from pneumonia. He believed it was best to let the patient alone, giving rest to the body, and then the patient would be the gainer. There was a distension of the abdominal wall which fixed the abdomen; the use of a tight binder would not keep the big vessels empty, but would embarrass the patient, and especially the movements of the diaphragm. The action of the abdomen was the mainstay for getting oxygen into the system. It was best to keep the belly as soft as possible.

Another point Dr. Morris Manges brought up which he considered to be a fetish. Relying upon strychnine as a stimulant was like relying upon adrenalin. If stimulants were needed in the early part of the disease, caffeine and digitalis could be used. Later in the disease camphor was of value.

Dr. A. D. BLACKADER (Montreal, Canada) differed entirely from the remarks of the last speaker as to the efficacy of drug medication in these cases of pneumonia. All who knew practical pharmacology knew what a definite action caffeine, strychnine and digitalis had on the respiratory centre and upon the heart muscle. Camphor was also a prompt but temporary stimulant, acting chiefly through the respiratory centre. He felt sure that benefit was obtained from their use.

Mr. WALTER ALDEN GRIFFIN (Sharon, Mass.) gave the history of the case of a woman patient with moderately advanced tuberculosis. She showed a tendency to temperature on admission, and was kept quiet for a few days. When she was allowed out of bed the nurse did not make sure that she had on sufficient clothing. She contracted a cold and the temperature shot up. There were signs of consolidation in a part of the lung which was previously clear. The sputa were rusty and contained pneumococci. The patient died after about two weeks' illness, during which time the temperature showed once a tendency to come down, but after a day or so mounted as high as ever. No autopsy was made.

Dr. HARRY LEE BARNES (Wallum Lake, R.I.) in closing his part of the discussion, said, in reply to Dr. Brown, with regard to the necessity of having an autopsy in order to determine whether or not pneumonia was present in a patient with pulmonary tuberculosis, he did not consider an autopsy necessary if the clinical course was typical. The case he had personally reported was a woman who had been running a slight tuberculosis temperature. Suddenly the temperature went to 104° F. and stayed there eight or nine days, and then went down with the typical crisis of pneumonia. She had the typical rusty sputum, dyspnœa and cyanosis. She presented, so far as he could see, every symptom of pneumonia that made up the clinical picture of the disease. The *Diplococcus pneumoniæ* was found in the sputum in great numbers. The lung cleared completely and the patient recovered.

THE AUSCULTATION OF THE WHISPERED VOICE.

By MORRIS MANGES, A.M., M.D.

NEW YORK.

For one reason or another the auscultation of the whispered voice has never become a popular routine diagnostic method, for every now and then one encounters a paper by an ardent but disappointed advocate of the method calling attention to its value, and regretting that its use has not been more favoured. Among such papers I would call especial attention to that of Bacelli, in which he claims that serous and purulent pleural effusions could readily be distinguished by the character of the whispered voice heard over the effusion. The fate of this claim is well known to all. It is due to such over-enthusiasm that this method has been unduly neglected as a routine procedure.

That it is a useful sign is the experience of all those who have employed it extensively. Laennec, who was the first to describe the method, gave very definite evidence of its value, and his statements have been corroborated by many other writers, among the most recent of whom I may mention Gerhardt, Bacelli, von Noorden, Sahli, Moses, Masing, and Amrein.

Inasmuch as the whispered bronchial voice has the same physical basis as bronchial breathing, it is its homologue, and has exactly the same significance as a physical sign.

There are several reasons why the whispered voice can at times give us more evidence than bronchial breathing.

(1) When the patches of infiltration are small and scattered, changes can be heard in the whispered voice long before the breathing becomes bronchial.

(2) When for some special reason bronchial breathing cannot be elicited because deep breaths cannot be taken by the patient, either because we are afraid to let the patient breathe deeply, as in recent hæmorrhages; or when severe pain or abdominal distension prevents him from taking a long breath; or in women, children, or other patients whom we cannot get to breathe deeply.

(3) The whispered voice is not transmitted to the sound lung, and hence cannot mislead us.

Clinically, we may consider the use of the whispered voice in effusions, tuberculosis, and pneumonia.

In pleural effusions the sign has no special value. The claims of Bacelli have long since been disproven, and any one who relies on changes in the whispered voice to differentiate serous from purulent or fibrinous effusions is doomed to disappointment. To determine the level of the fluid, it has no special value except of a corroborative nature.

For the recognition of early tuberculosis a number of writers (Moses*, Masing†, and Amrein‡) have recently published papers in which they urge that with the whispered bronchial voice one cannot alone detect lesions at a very early date, but one may also determine whether the lesions are actually cured or not. They claim that long after the râles and dulness will have disappeared the persistence of the whispered bronchial voice over the area indicates that the infiltraton is still present.

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* "Beiträge zur Klinik der Tuberkulose," Band iv, p. 151, 1905.
† *Ibid.*, Band vii, p. 363, 1907.
‡ "*Correspondenzblatt für Schweizer Aerzte*," Band xxxviii, p. 323, 1908.

They also claim that the auscultation of the whispered bronchial voice will indicate the presence of small patches of tubercular infiltration, especially where dulness, broncho-vesicular breathing and râles are either inconstant or not very marked. My experience with the auscultation of the whispered voice for this purpose is that this sign is too delicate, and is hence liable to mislead, just as do the too delicate tests for albumin and sugar in the urine. In the apices and at the roots of the lungs, especially near the large bronchi, the chances for erroneous interpretation of this sign are very great, since normally in a number of individuals the whispered bronchial voice can be heard distinctly, especially in children. I would therefore urge that when the whispered voice is distinctly heard over the trachea, one should be very careful in laying too much stress on the presence of the whispered bronchial voice, especially when the signs of infiltration of the lung are very slight or vague.

Physical signs to detect the early tuberculosis of the lung are not lacking. If anything can be said it might be to object that we have too many of them. Let those which we already have be studied better and applied more diligently, and by all means let them be combined with a more careful anamnesis. In a large majority of cases we will be able to make fairly good diagnoses, and early ones too, provided we get the co-operation of the patient. How often we hear the physician blamed for not making an early diagnosis when the fault is really the patient's and not the doctor's. They either do not co-operate with him, or do not see him early enough or often enough to give him a reasonable opportunity to make the diagnosis. One other fault may be laid at the door of the patient, namely, that either wilfully or unknowingly, the family and the previous history are not truthfully stated, or symptoms are not properly described in spite of careful and prolonged questioning.

The whispered voice should be employed in all cases of hæmoptysis, especially if we see the patient for the first time, and have no knowledge of his pulmonary condition. Here the whispered bronchial voice may readily tell us whether there is any infiltration of the lungs without causing injury to the patient by our examination.

In pneumonia, as already stated, small areas of consolidation occur in which there is not much change in the percussion note; the whispered bronchial voice may be very useful in directing attention to areas of beginning consolidation, the signs of which will become more marked on the following day. Leichtenstein is one of the few recent writers who emphasizes this point. "I have learned to especially value whispered bronchophony in the detection of small patches of consolidation.*

Another use in pneumonia is much more important. I refer to the cases, which are by no means infrequent, where the signs at the base of the lungs posteriorly are such that it may be difficult to tell which side is involved. The percussion note of the sound side may be distinctly duller. Bronchial breathing and râles may also be present, and a true consolidation may be diagnosticated when in reality none exists. In these cases the bronchial breathing and râles which are heard at the base are not due to any infiltration, but have been transmitted from the affected side to the sound side. Dulness, which may even be marked, may be elicited over the sound lung when the percussed lung is on the dependent side. Cabot and others have called attention to this fact, the importance of which is not sufficiently recognized. Add to this the difficulties and the hurry of physical examination of the very sick pneumonia patient, and it is not to be wondered at that consolidation should be diagnosti-

* Influenza, Nothnagel's "Specielle Pathologie und Therapie," Band iv, part i, p. 100.

cated, especially in the presence of loud bronchial breathing and râles. These râles may be either hypostatic, or they may be transmitted to the sound side. The bronchial breathing may also arise in part from the hypostasis, but it is mostly due to transmission. One physical sign alone, the whispered bronchial voice, cannot be transmitted, and according to its presence or absence a positive diagnosis of consolidation may be made. When it is absent we may be sure that the other physical signs of consolidation, no matter how marked they may be, are fallacious. What makes this use of the whispered voice particularly applicable in such cases is that it makes no extra demands on these very sick patients, and is in no way influenced by posture.

Why it is that the whispered bronchial voice cannot be transmitted while bronchial breathing and râles can be, I have been unable to ascertain or to explain. I can simply refer to my clinical experience. I have had no opportunity of proving these statements by *post-mortem* examinations, as the cases in which such proof might have been obtained unfortunately did not come to autopsy. However, definite proof was obtained by radiographs of a number of such cases. Furthermore, the failure of these so-called double pneumonia cases to pursue the clinical course of consolidation on both sides establishes their spurious nature. I believe, therefore, that double pneumonia of the bases is frequently diagnosticated when in reality only one lung is involved.

In conclusion I would urge that while the range of usefulness of the auscultation of the whispered voice is not as great as some of its advocates would claim, yet it can often afford so much information that its routine use in physical examinations should not be neglected as much as has been the case.

DISCUSSION.

Dr. JUDSON DALAND (Philadelphia, Pa.) said that it seemed to him that the paper was very conservative, and called to mind many facts long known. The main point was the usefulness of the auscultation of the whispered voice in small consolidations, and also its usefulness where one did not wish to have the patient disturbed more than was necessary, particularly in cases of hæmorrhage.

Another point was in regard to the advisability of using the whispered or the spoken voice. An interesting observation was made some years ago on a patient who was being operated upon. The heart was exposed to view, and one could see distinctly and plainly that they were dealing with space. Although he did not make a very careful examination fremitus could be distinctly and plainly felt. More was conveyed in that way than one thought.

Dr. Daland thought that the contribution was a very valuable one, and was specially useful when they were dealing with disseminated consolidations which were so easily overlooked. He had overlooked many of them. These findings should be checked up by the skiagraph. This particular method gave the best of results.

Dr. J. M. ANDERS (Philadelphia, Pa.) said there was only one point to which he wished to refer. A great deal of valuable information might be obtained by careful inspection. He had never known of one side being affected by a pneumonic process where the opposite side did not show a greater mobility. He thought that what they learned from inspection was very important.

NEURASTHENIA IN THE UNITED STATES.

By J. MADISON TAYLOR, M.D.
PHILADELPHIA, PA.

Neurasthenia is a popular and inexact term used to designate a host of distressing phenomena hindering efficiency. These dominate and confuse manifold economic, social, and clinical problems.

Among the pageantry of invalidism are irritability, unrest, prostration, impermanence, irascibility, and other insignia of impaired dynamics, indicating morbid fatiguableness.

When employed loosely, the term neurasthenia, or psychasthenia, serves to obscure a right estimation of definite symptoms of mental and physical exhaustion and of true disease states. It likewise interferes with prompt application of well selected remedial measures. However one may interpret the much abused term, there is urgent need for solution of the subproblems involved.

Certain postulates are offered :—

The Essential Causes of Neurasthenia and its Congeners.

In the United States widespread evidence exists of constitutional susceptibility to factors of exhaustion. It is probably on the increase, or at least, observed with greater accuracy, is becoming scientifically classified, and sufferers are now treated with judgment.

The fundamental agency in the production of nervous irritability, or subversion of vital energies, is, in my opinion, to be found in peculiarities of climate not adequately reckoned with, and their corollary, careless omissions to observe economic modes of life, whereby the hurtfulness of local climatic conditions can be escaped. While this holds true for all types of people, it is of special consequence for blondes. Among blondes, especially in the third and fourth generations, are notable instances of neurasthenia to be found in tropical and subtropical climates.*

The casual factor cited is in strict accord with anthropological findings. While many disturbing agencies are and can safely be ignored, history has yet to show that racial adaptations reach a negligible status unless essential conservations are observed, and plenty of time is allowed for reparative adjustments and adaptations, which are invariably slow, occupying not less than many centuries.

It is a well-established principle that racial evolution by selection takes place by a process of invariable and merciless elimination. Every character acquired by a species marks a step in age-long processes of selection and rejection whereby adaptations are achieved constituting conditions for survival.

One race of pronounced type, or character, when suddenly transplanted to a hostile environment, does not and cannot merge or blend into local types, but disappears, evaporates.

For example, the blonde Northmen who over-ran Southern Europe, founding empires, dominating local races, for a brief period, wholly disappeared in a few generations.

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* The scientific evidence on which these opinions are based is to be found among the works of anthropologists, though there is diversity in conclusions. We are indebted most to the painstaking observations of Colonel Charles E. Woodruff, M.D., U.S.A. His book, "Expansion of Races," should be read by all Americans. See also paper by Austin O'Malley, in *American Medicine*, November, 1908, "The American Climate and the Northern European." It is my intention to expand the present sketch on another occasion.

Also the pre-Homeric Greek invaders from the north vanished, as did the Baltic types.

The same is true of the Aryan races that overflowed into Ceylon, Java, and Sumatra, leaving traces of a noble civilization; so likewise of less notable incursions of black or brunette peoples into Western Europe, *e.g.*, Attila, the Great Khans, Tamerlane, the Turks, &c.

Races can, and occasionally do flow out of their normal habitat, become adapted to new and foreign habitudes, conditions, often to their advantage. The process is ever and always by extremely gradual approaches, affording ample opportunity for deliberate adaptations to climate and other local peculiarities or conditions.

Race survival is conditional upon a variety of economic factors, all clearly in accord with the laws of selection, accommodation, conformation, in brain, skin, hair, nostrils, &c., and not less in mental and moral traits. Each type becomes fitted to reside in a special locality and is then unable to acclimatize elsewhere.

"Man and other species resemble glaciers in plasticity, for though apparently hard, rigid, and unchangeable, yet they are moulded like clay in new forms by very slow migrations or changes of environment; a process extending over immense ages and really resulting in new types adjusted to the climate and unable to return to the ancestral home"* except by the same evolutionary steps.

The United States lies in a latitude similar to that of the Mediterranean basin. The Canadian border on the north is about on a line with the Riviera, southern France, and the upper part of Spain; and Mason and Dixon's line, between the North and the South, is practically on the parallel of the North African coast. Labrador is in the latitude of

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* C. E. Woodruff, *op. cit.*

England. The zone of the brunette man is from the thirty-fifth to the forty-fifth parallel. The forty-fifth parallel passes near Halifax, Bangor, Ottawa, St. Paul, &c.

The isothermal lines, we are told, dip southward in America, and account for temperature differences. So they do, but nothing can alter the insistent factor of equivalent solar energy, sun glare, in any tropical latitude. It is this feature which gives character and ferocity to our long summers. This protracted, sustained summer heat and sunlight is precisely the same in any similar latitude, despite any or all local modifications. Overplus of heat, and especially of light, has been demonstrated to be the chief agency in producing tropical neurasthenia. We, in the United States, exist under the same, or similar, conditions of, or effects on energetics as those in other tropical countries.

Physicists that work with extraspectral rays, Röntgen rays, Becquerel's rays, Blondot and Charpenter's rays, and the rays from actinium, polonium, and radium, must protect themselves or they will be severely burned, or suffer other serious damage. . . . The same rays, of course, exist in the sunlight, and we receive most of them yearly between the middle of June and the middle of July, the month of suicide and homicide.

Finsen found that skin pigmentation can protect animal tissues from ultraviolet light. Therefore the stronger and more direct the sunlight upon the earth, the more pigmented the people that live under it. Even on a cold plateau like Thibet the inhabitants are brunette because the sunlight is bright and copious there, and the Eskimos are dark as a protection against the sunglare upon the Arctic snow.*

The belief that abundant sunlight and heat are essential for growth holds true, with modifications, for most vegetables. The idea that man is better for all the sunlight he can get is a reflex of sentimental ancestral notions, poetic verbigeration, familiar contrasts, cheerful assumptions, because a bright day is agreeable after dark days.

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* Austin O'Malley, *op. cit.*

Man is, however, not a vegetable, but a human animal, subject to the same limitations by environment as brutes and subject to the same imperative conditions for adaptation. In all animals these adaptations demand for safe and wholesome evolution much more than transplantation; no less than long periods of gradual adjustment to new modifications by environment. The invariable rule of such qualifications is that *those individuals suffer most who exhibit least the physical characteristics or conformations necessary for survival in any climate for which they are not adapted by age-long evolution and deliberate selection.*

The tendency for successive generations of blondes to deteriorate in a hot, glaring environment is clearly determined. The basis for this, as Colonel Charles E. Woodruff pointed out in 1900, is a progressive lowering of tone and resisting power in the central nervous system; a pitiless weakening of vital forces simulating neurasthenia. Disintegration of the vital forces necessary for sustained endurance encourages and strengthens divers hurtful agencies. Energy is a characteristic of peoples reared and evolved in cold, cloudy, dark countries. Active exertion is not only hurtful in the tropics, it makes for manifold destructive effects on vital structures. Those who survive in the tropics are those best capable of habitual indolence, quietude, restfulness, with only spasmodic energizing.

Physiologists have studied the problem somewhat; there is, however, needed much more exact research in anthropology as well as physiology and clinical experiences.

Woodruff quotes Warren Lombard (*Journal of Physiology*, 1882) to the effect that: "Muscular power is materially decreased in summer by several days of high temperature, especially with great humidity."

Grigens (*Archiv für Anatomie und Physiologie*, 1902) has studied the reaction times of Europeans and Malays, and

found that a "sojourn in the tropics reduced the time 14.4 per cent., as compared with those found in Europe." He thinks that "there is a general retardation of all nervous processes, and the necessity for overcoming this inertia is responsible for the greater prevalence of neurasthenia in the tropics."

Conditions for efficient re-energizing or recuperation, such as sleeping, must be those of the normal environment —for the blonde a low temperature, for the brunette "genial warmth." While individuals of the white race are capable of living anywhere, all history shows that they deteriorate soon, or at least not late, in an alien environment, both as individuals and as a race.

The relaxed, perspiring skin of the blonde under tropical temperatures is precisely the same as one in a warm or hot bath, which when prolonged is admittedly weakening; when indefinitely prolonged, cruelly exhausting. A lowering of the circulatory tone is thus induced, a reduction of efficiency and recuperative power precisely analogous to true neurasthenia. Not the least of these damagements is a lowering of moral tone. This is shown in "loss of memory, loss of muscular strength, increasing presbyopia, and other signs of exhaustion."

Lombroso's tables showing the monthly genesis of insanity in Europe, bring out the fact that by far the largest number of instances (nearly double) occur from April to August inclusive; least in January and February. Suicide is vastly more common from April to August (most in June and July) with a marked increase on hot days, and especially humid ones.*

Conscience becomes dulled, loss of temper explosive and extreme, during protracted heat, constituting a gradual

* See article in *McClure's Magazine*, June, 1908, by George Kennan, "Problems of Suicide."

debasement by environment. Such effects are especially noticeable in the very young and very old, and more so in women than in men. All these facts are related by numerous and competent observers.

The Remedy.

If the foregoing postulates can be sustained, then the remedial measures are obvious and urgent.

Methods of life should be adopted designed to meet these and similar exigencies. In the United States, so soon as the providentially cool winters are over, we enter a period of practically tropical weather. There may be comfortable days, but always they alternate with sudden and often protracted periods of heat, and at all times the solar energy and intense light are essentially subtropical and exhausting.

It seems well established that forces are at work throughout the major portion of the United States tending to lower powers of endurance, to increase susceptibility to fatigue neuroses and psychoses. Doubtless the causes are complex. Many of them are traceable to heredity, inheritance, faulty habits of life, erroneous personal conduct of one sort or another, prodigalities of energizing, "overstrenuousness," keenness in competition, pressure of social and economic "necessities," and the like.

There is among us a composite population, from northern and central Europe, with even larger numbers now coming from southern Europe. Those arriving from the older sources of emigration now tend to stream steadily northward into Canada. A large proportion of our population is from subtropical Europe, with brown or yellow skins. These thrive excellently and multiply satisfactorily. Then there are those of Anglo-Saxon, Scotch, Irish, German, Dutch, Slavic, and other peoples from northern Europe. Here they are; they cannot all move away. Statistics, or a

right study of existing statistics, are needed to determine whether there are, or are not, among the descendants of these blondes more recognizable effects of racial deterioration than among the brunettes. Attention should most certainly be focused upon the subject.

Careful observations should be made by physicians along these lines. Hospital and dispensary statistics should be studied to determine whether or not neurasthenic phenomena are exhibited most largely among those of northern racial stocks.

Meanwhile, it is pretty generally admitted that among our more urgent clinical problems is the one of prevailing neurasthenic phenomena. This obtrudes in the face of the fact that our people are well fed, well housed and clothed, in short, enjoy a degree of prosperity far in advance of many other countries. It is plain that diligence should be shown in learning how to mitigate and correct the causes, so far as is possible and practicable.

There is concurrence of opinion on one point, *viz.*, our summers are hotter; more solar energy is exhibited in the form of glare, capable of contributing to the production of phenomena of depression, than is observable in Europe, north or south. Our temperature changes are swifter; diurnal curves of heat and cold are larger, variations in humidity more extreme. No one of these may be accepted as adequate to account for the distresses and damage demonstrated. The significance of the climate factor cannot, however, be ignored.*

During our subtropical and protracted summers it is the part of economy to adopt forms of conduct, habits of life,

* A patient from Odessa, southern Russia, in answer to my question about climatic conditions there, said: "At least, extremes of temperature representing the four seasons do not occur in any one day."

of dress, of food, of hours, and conditions for work and play, in strict accord with those found by universal experience to be most compatible with the climatic factors to be reckoned with.

Violations of these elements of conservative personal hygiene are met by swift and condign punishment in the tropics. Are not many, if not most, of our own susceptibilities to exhaustion states due to the same or similar agencies?

If it be established, as seems probable, that the numerous and increasing evidences of neurasthenia in the United States are explicable on the same grounds, is it not imperative that we accept the insistent hints thus offered and adjust our habits of life to meet menaces to physical and mental integrity by employing practicable relief measures?

The directions in which modifications of personal hygiene are needed to conserve and enhance capacity for endurance, economic efficiency, and also the avoidance of exhaustion states, are, among others, these:

So soon as the summer solstice is established, then hours for work should be changed, beginning earlier by an hour, with an extra hour or more at mid-day devoted to rest *siesta*. This is especially urgent for those who work in the sun. For all, the hours of work in midsummer ought to be fewer. Experience in the tropics demonstrates that better results are accomplished in four or five hours a day than in seven or eight. The total output of force is only so much, and the resultant is better work with shorter hours for labour.

Children should be kept under shade during the noontide and encouraged to sleep. Provision should be made for covered playgrounds, and abundant facilities for cool baths.

Our customary clothing is by no means suited to our

tropical summer climate. Precautionary measures, hygienic and industrial, urgently demand attention.

Tree planting should be encouraged, even made obligatory, in cities, villages, along highways, and about detached dwellings. Statutory enactments may be essential to enforce arboriculture.

All practicable devices for cooling houses in summer should be utilized; among the best of these are electric* power fans, dark awnings, penthouses over windows and doors.

All sustained activities should be intermitted by opportunities for midday rest. A short sleep is then essential for weaker persons, and desirable to conserve the output of results for every one.

By such means as these may we confidently expect large economies in health and invigoration. By neglecting or ignoring these essential modifications of conduct, we may with equal confidence expect a steady increase in the phenomena of exhaustion now plainly in evidence.

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[6] Motor fans afford immense comfort and contribute notably to oxygenation and invigoration.

THE RESULTS OF DISPENSARY WORK IN THE CONTROL OF TUBERCULOSIS.

By CLEAVELAND FLOYD, M.D.
BOSTON.

Clinical effort, which often goes by the name of "dispensary work," is rarely called upon to direct its attention to the control of any disease. Its work generally deals with a collection of individuals with many types of illness and requiring as many different methods to obtain relief. In taking a part in controlling tuberculosis, the dispensary may unify its efforts in combating one disease on well-drawn lines.

The fact that the sanatorium has been in existence for years has firmly established it in its pre-eminent *rôle* in the treatment of incipient cases. The hospital for the isolation and care of those advanced in the disease, while of more recent growth, is now fully recognized as an essential factor in its suppression.

But with all sanatoria and hospitals the problem is an individual one, and the underlying causes of the disease can receive but limited attention. The field of the dispensary lies largely between those efforts directed towards the cause of tuberculosis on the one hand, and its isolation on the other, and yet, among all agencies working toward the limitation of this disease, it has perhaps the least fixed position. Tuberculosis must largely, because of its exist-

ence in the home, be checked there in its course; the disease while still obscure must be detected, the services of the sanatorium or hospital obtained, where they are necessary, and their work made productive of the greatest amount of good by means of prolonged supervision. If this is conceded to be the part that the dispensary is called upon to fulfil, a test of its efficiency may be obtained by the results that appear in the following directions:—

(1) How many cases of tuberculosis have developed among those under clinical supervision during an observation period of several years?

(2) How many cases regarded primarily as negative have, in a period of months, been proven to be positively tuberculous?

(3) How many cases regarded as tuberculous have been followed through the course of the disease until an arrest has been well established or hospital care provided for them until death?

The thoroughness of the work of prevention, the accuracy of diagnosis and provision for those suffering with tuberculosis will thus be clearly shown. How far the dispensary has met these demands has never been fully studied, as far as I am aware.

Any clinic for tuberculosis should periodically put itself through such a test of efficiency in order that its routine may not become worn out, and the individual case become lost sight of in the aggregate.

The work of the Clinic of the Boston Consumptives' Hospital which has now been carried on for about five years has offered an opportunity to gather facts along these lines in Boston, and I have made a statistical study of what has been accomplished among such patients as have presented themselves for treatment.

In this, as in other clinics for tuberculosis, all classes of

patients complaining of pulmonary symptoms are received for treatment. Of necessity, therefore, in many instances, must cases of non-pulmonary disease be considered and examined into. There are also many instances of patients who have been exposed to tuberculosis who come for examination. The clinical material consequently at our disposal has consisted largely of three groups of cases:—

(*a*) Negative cases.
(*b*) Cases of non-pulmonary disease.
(*c*) Cases of pulmonary tuberculosis.

The duty of the clinic towards the well or negative case consists first of all of being sure that there is no question of health, and second, that the symptoms of the patient, or the surroundings that have given rise to suspicion, are improved. Too little thought is given to the healthy as they pass through the routine of examination, for it is just as important that they remain well as that others that are sick should be provided for. Often on account of conditions that threaten health a negative case will have to be continued under observation for a considerable period of time and this may run into years before all that should be done is accomplished. No tuberculosis dispensary is well balanced in the scope of its work unless at least one-third of the patients it reaches out for are proven to be negative ones.

The cases of non-pulmonary disease require little more than to be referred to a general medical clinic. In regard to the cases of pulmonary tuberculosis the dispensary has, as its duty, to make an accurate diagnosis, settle upon a suitable disposition in every case and provide supervision in every instance as long as it is required.

All the efforts of a clinic, no matter whether its work is general or specialized, are to some degree negatived

through the mass of clinical material that presents itself and the failure of the individual patient to sufficiently co-operate. It is not uncommon for a patient coming in for examination to give a fictitious name and address, in order that he may never be traced. Frequently a patient will change his address as often as once a month, or even once a week, and in spite of all efforts he is soon lost track of. Many patients who have once reported for examination on account of pulmonary symptoms, and have been somewhat relieved by treatment, will resent all later attempts at further inquiry into the state of their health.

The lack of exactness in the diagnosis of diseases of the chest, giving rise as it does to a confusion of opinion among physicians, too frequently offers a loophole of escape to the patient from his worst fears, and often the truth as to his condition is never brought home to him and the value of the clinic in the case comes to an abrupt end.

The ready assurance which the arrested case of tuberculosis has in himself, feeling as he does that further trouble after leaving a sanatorium is impossible for him, is the cause of many relapses and the disappearance of many patients from the roll of the clinic.

The constant movement of patients to the surrounding towns and cities of Boston, especially people of the Jewish race who do not take kindly to institutional treatment, adds to the ineffectiveness of this type of work.

In any estimate of the results accomplished through a dispensary, these difficulties must be considered. They will vary much in the extent to which they are an embarrassment in different sections of the country, and will depend to a considerable degree upon the support accorded by allied hospital and health departments. But even when co-operation has reached a high grade they will still be present.

Statistics to be of value must be based upon sufficiently

large numbers to give a fair average, and to afford anything like accurate conclusions. For this reason the results obtained in the first five thousand patients examined at our clinic beginning September, 1907, and continuing into the middle of the year 1909 have been made available. Since this latter date three years of observation and disposal of the patients have elapsed. While I fully realize that in some instances where the statement of the patient has had to be taken as to his condition, inaccuracies will creep in, nevertheless, I believe the figures obtained are sufficiently reliable to be of value.

Among some five thousand patients there were found to be, as the result of their first examination, 2,121 positive cases of phthisis, 1,130 who were suspected of having the disease, and 1,707 who were negative on first examination. Of the remaining forty-two we have insufficient data. Of this total number 1,315 were lost to the clinic through their giving an incorrect address, or through their moving away. They were divided as follows: 575 were considered negative when lost to the clinic, 382 were suspected cases, and 358 had definite pulmonary tuberculosis. In other words, about one-sixth of the positive cases were lost sight of during a period of observation varying, according to the individual case, from two to four years. It is only natural to expect that the group of negative cases lost should be by far the largest one, as in almost any clinic it is the custom to give less attention to this group than to those demanding active supervision. The group of suspected cases as a result of continued study gradually separates itself into positive and negative; generally the larger proportion being grouped with the latter.

The apparent good health enjoyed by most of this class makes for little interest in a tuberculosis clinic, and once through the routine they frequently disappear or cannot be

driven to return for further examination. Among 358 cases of phthisis who were lost from observation, 247 cases were never found upon home visitation and never subsequently reported at the clinic after the first clinical examination. In other words, these are the tuberculosis "carriers," the indiscriminate spreaders of the disease. The man who suspects he has phthisis and yet desires to hide it at the expense of the public, will in all probability be increasingly in evidence as the supervision of cases through the local Board of Health becomes more efficient.

Whether the time will ever come when it will be necessary to establish observation wards in connection with our institutions for tuberculosis in order to detain such patients as seem likely to drift into this class will remain for the present an unsettled question.

That large group of cases which are constantly moving from place to place and thereby spreading infection with them, can be greatly decreased by immediate and close observation in their homes in order that their future movements may be determined, or by an ordinance preventing their removal till approved by the Board of Health. For those patients who move without the city limits and consequently escape the jurisdiction of the Health Board, either State supervision or a metropolitan plan of co-operation among tuberculosis clinics will meet this need.

By these measures the floater and drifter having active tuberculosis in the community can be much more readily controlled and the work of the dispensary made productive of greater usefulness at one of its weakest points. There is a definite class of people seeking treatment in a dispensary that demand prompt measures if the end we seek for them is to be accomplished. Delay in giving relief or in providing hospital treatment, quickly ends the usefulness of the clinic through dissatisfaction over what they think should be

accomplished for them. Until this is more fully appreciated by those in charge of institutions caring for the consumptive a fairly large percentage of positive cases will continue to be placed among those lost sight of.

While the total number of cases who have been lost to the clinic appears large, making as it does about one-fifth of the number investigated, we must not forget that in any large city, with a rapidly shifting population, this will occur, and it is much more in evidence in large cities like New York and Chicago than it is in Boston. With the firm establishment of a dispensary in any community through its securing a hold upon its patients, there must in time be a marked reduction in the number of its cases who drop out of sight.

It occasionally happens that patients who have been found free from pulmonary disease on their first examination and of whom we have had no knowledge for some years, drift back to the clinic, showing active tuberculosis. Responsibility for this condition most frequently lies with the individual. Nevertheless, if each person going through the routine of the clinic has the dangers of tuberculosis sufficiently impressed upon him, as well as the importance of proper living, this will rarely occur.

In nearly every instance where one of our patients has reported for examination, there have been symptoms that gave concern as to the condition of the lungs, or exposure to tuberculosis has taken place. On account of these facts therefore the aftermath of our negative cases is of some importance, 1,707 such are included in our first 5,000. Of these 604 have recently been examined and found well, 520 have reported themselves to be well or suffering from complaints other than tuberculosis. Of the remaining 635, 575 are included in the group of lost cases, and only twenty-four have developed pulmonary tuberculosis, or less than one per cent.

Fully two-thirds of these cases have been exposed to phthisis and these figures speak for the power of isolation and observation in checking this disease.

But the test of how efficient a tuberculosis clinic and its work in the home may be, is also strikingly shown by the demonstration of how many cases which have been suspected of having the disease have subsequently developed it while under observation for a period of years. The large number of patients suffering from overwork, anæmia, debility and bronchitis are always open to the possibility of having tuberculosis. Furthermore, slight chest deformities and poor lung expansion frequently give rise to just enough signs to demand constant observation. In all, 1,130 patients, presenting just such questionable evidence of phthisis, were among our first 5,000 cases. Of these 382 have disappeared and all trace of them has been lost, 748 have been successfully followed, and 62 cases have developed phthisis. This number also includes those whose condition rapidly changed after their first examination and who were in a short time proven tuberculous.

One of the chief difficulties in any large clinic for tuberculosis is the trouble which arises in surely making the diagnosis of incipient phthisis from slight signs. This most frequently occurs in children, and unless every means of diagnosis is at hand many cases drift away to the dissatisfaction of physicians and patients. To distinguish between physiological differences at the right apex and early tuberculosis is no easy matter. I have been much interested in following these cases of questionable right apical signs, who are often classed as questionable cases, to see if in a relatively short space of time tuberculosis developed. Among a total of 1,130 cases suspected of pulmonary tuberculosis 626, or a little more than 50 per cent., gave signs at the apex of the right lung. The others are almost equally

divided between questionable signs at the left apex and base. Almost without exception, in these cases there has been a disappearance of these signs or where they have persisted active tuberculosis has failed to develop. Where the right apex has shown questionable involvement, sixty-two of the number of cases that we have been able to trace have developed phthisis.

It would seem from our observations in this series of patients that the lack of pulmonary lung expansion and chest development, together with the not infrequent condition of an old inactive apical process, most commonly give rise to these signs.

In order that the increasing good which is manifested by the isolation of cases suffering with phthisis may be realized to its fullest extent, it is the ideal of every institution for tuberculosis to provide for every case within its wards as long as they are a danger to the community. As yet this is far from possible, both on account of the still inadequate number of beds, and also because of the refusal by many patients of the opportunity for hospital treatment when it is presented. It is important, however, to know as far as possible whether in the instances where death has occurred it was in an institution or not. My statistics show that among 600 cases a little less than 50 per cent. died in a hospital, the remainder were cared for by nurses in the homes of the patients. In almost this entire group, however, hospital treatment for varying periods of time during the illness occurred. Local sentiment and local conditions, depending largely upon the proximity of the hospital and its reputation among the sick, will naturally make this state of affairs a variable one.

The more closely the hospital organization is in touch with its patients, socially as well as medically, the easier the solution of this difficulty will be. Where it is the

policy, as in Boston, to utilize to the fullest possible extent existing sanatoria and hospitals in caring for patients and not to encourage treatment at home, the value of institutional care cannot but be realized in the community and the opportunities thus offered more completely utilized.

If the statistics here given demonstrate anything they would seem to show that a dispensary has a well-defined and valuable place in the control of pulmonary tuberculosis. Its work cannot be measured in the terms of "cases cured" as can that of the sanatorium, but its usefulness will be almost entirely along the lines of diagnosis, isolation and prevention. The conclusion would seem justified, that in the absence of any specific remedy for pulmonary tuberculosis, its suppression will be brought about by the multiplication of those agencies at present working against it. Neither the sanatorium, the hospital, or the dispensary alone can make much headway, but in working together as one unit, they must in time fully justify their existence.

DISCUSSION.

Dr. H. R. M. LANDIS (Philadelphia, Pa.) said he would like to give his endorsement of the usefulness of dispensaries; the dispensaries of to-day played a more important part in the care of the tuberculous than they formerly did. As already pointed out, one of the greatest drawbacks up to the present time was the attempt to cover too much territory, thereby giving a greater opportunity for the patients to escape attention. Of the 1,100 cases he had studied during the last seven years he had lost sight of 320. Out of that 1,100, 915 were treated on the basis that they were tuberculous. There were 410 who died of the disease. There were 184 living when the work was stopped in 1911. Of these 184, 107 were back at work.

He said that as it now stood patients who were discharged from sanatoria usually had the conviction in their minds that they were cured of the disease, and that, therefore, it was not necessary to pay any attention to the doctor's orders regarding the future care of themselves. The result was that in a short time probably 75 per cent. of them drifted back to the same life they led before. It seemed to Dr.

Landis that all patients should be strongly urged to return to the dispensary and report at certain intervals, and, so far as possible, report in groups. Educate them to the necessity of keeping up the method of living outlined; this should be constantly kept before them. Of tuberculous patients not more than 3 or 4 per cent. go to the sanatoria at all, but they go to the dispensaries.

Dr. CHARLES L. MINOR (Asheville, N.C.): The longer I treat cases of pulmonary tuberculosis, no matter to what class of life the patient belongs, I am more convinced of the absolute necessity of closely following the patients afterwards, either by their family physician or by a district nurse or by some means, if they are not to relapse into their original condition. A great many patients, however plainly you explain matters to them, think that when they are discharged they are really cured and can return carelessly to the life they lived before. Of course, this is largely the fault of the doctor in not making plain enough to the patient the exact status of the case when he goes home; but it is also due to an inherent hopefulness in human nature, and will be difficult to entirely overcome. To our intelligent patients it is not difficult to make this matter clear, but to patients of the lower classes it becomes a very difficult matter, and one which is more often responsible for their relapse than anything else. However encouraging the patient's condition when he returns home he should be seen at least every two weeks, later every month, and then at least every three months for three years. Such patients should be constantly warned and watched by their family doctor, or if they are of the poorer classes by the dispensary doctor or the visiting nurse, and it should be constantly drilled into them that they are not yet well and that they must live the right kind of life always if they are to remain in good shape, and that a clinical cure cannot be expected to be obtained under two or three years of continuance in well-doing.

Dr. H. H. WHITCOMB (Norristown, Pa.) was pleased with the paper and Dr. Floyd's method of keeping the patients together and keeping track of them. The great difficulty they met with in Norristown Dispensary was the ignorance of many of their patients and those who believed in taking medicine. This was the chief trouble they met with in Pennsylvania. It was almost impossible to get them to return to the dispensary unless it was to return for some medicine; therefore they were usually given some placebo which caused them to return to have it refilled. If these patients were taken away from their occupation and no suitable employment found when able to work, they soon would drift back into the same condition they were in when first seen or worse. Occupation should be sought for them.

CHEST AND SHOULDER PAINS IN PULMONARY TUBERCULOSIS.

By FRANCIS MARION POTTENGER, A.M., M.D., LL.D.
MONROVIA, CALIFORNIA.

Patients afflicted with pulmonary tuberculosis are subject to many disturbances on the part of the peripheral nervous system. The disturbances are sensory, motor and trophic in character. I have published my observations on these conditions elsewhere. Three years ago I read a paper before this Association dealing with reflex muscle changes which affect the neck and chest muscles when the lungs and pleura are involved. At this time I thought it might be of value to present for discussion the question of the neck and chest pains which occur in intrathoracic inflammations, particularly tuberculosis.

This very important question has received very little attention in medical literature, usually being passed over with a bare notice; while, from the frequency with which these pains are found, alone, they deserve more careful attention. There is still a more important reason for more accurate information; these pains are of diagnostic importance, and they are frequently mistaken and erroneously treated.

These pains vary in character from a mere uneasiness, a "feeling of being tired," which is specially noticed through the shoulders and interscapular region, to a distinct severe localized pain. Aside from the pains due to pleurisy there

are at least two important causes of pain in tuberculosis; one general, the other local or regional. The general pain is the one which is best known. It is usually a vague aching, although it may be a severe pain which may affect any portion of the body. It is believed to be of toxic origin. As causes of toxic pain we have the tubercle toxins; the toxins of associated bacteria, when present; those resulting from the absorption of the products of autolysis; and the absorption of toxic products from the alimentary canal. As a cause of local changes in sensation we have the reflex sensory disturbances, which have been so carefully worked out by Head. Aside from these I wish to call attention to a localized pain which may be very slight in character, or may be very severe, and which I believe to be a true neuritis of reflex origin.

When a patient suffering from tuberculosis complains of discomfort or pain about the chest, if pleurisy can be excluded, the explanation given is usually that of a toxæmia. While studying the regional spasm and degeneration of the muscles which occurs in tuberculosis, I was impressed with the fact that many of these neck and chest pains are also regional in character. They are apt to be localized much as the muscle changes are. Careful questioning shows that the aching or pains felt in the scapular region, even in early infections, seem to be confined to the side involved. In the majority of instances, when patients come to me they complain, if at all, of both sides; but this is due to the fact that there is usually a double infection when the patient presents for examination. In fact, if I find a tuberculous patient, who complains of aching in both scapular regions, I am inclined to believe that both lungs are involved. If my suggestion of the cause of this phenomenon is correct, the reason for my belief is plain.

I do not wish to intimate that this aching is confined to

the scapular regions, for it is not. It may be found in the shoulders, neck or anterior portion of the chest wall. Not only may the sensory changes be slight, but they may be very marked. I have seen the pain so severe that morphine was necessary for its relief.

The interesting fact about the pains which I am describing is their regional nature. They occur on the same side with an involvement of the pulmonary parenchyma. Where the lesion is unilateral this is not so difficult to make out, but where it is bilateral it is more difficult to make the relationship clear beyond question. Yet clinical study of the case will usually show why it should be present on the one side and not on the other, or be more severe on the one side than the other. The side of the greater pain is usually the seat of the greater amount of inflammatory change.

If we should seek a justification of our theory that these pains, particularly the severe ones, are due to a reflex injury to the nerves, a neuritis, we have ample data at hand, *viz.*, first, Head's explanation of the sensory changes in the skin of the neck and chest of reflex origin through the sympathetic nerves, which are practically confined to the affected side; second, the regional atrophy of the skin and subcutaneous tissue on the side of the involved lung in chronic tuberculosis; third, the changes in the muscles (spasm when the pulmonary involvement is in a state of active inflammation and degeneration when the process has become chronic) which is confined to the side of the chest which is the seat of the inflammation; and the dry arthritis which is so often found affecting the shoulder-joint on the side of the pulmonary involvement. Since all these phenomena, together with the neuritis which I am describing, are of the same general character, in that they are confined to the affected side and associated with the distribution

of nerve fibres which take their origin from the cervical portion of the cord, that being the portion of the cord which receives the impulses through the sympathetic nerves from the inflamed lung, we are justified in looking for a common cause. This we have in the segmental reflex.

Further proof of the correctness of this explanation is afforded by the clinical work of Bálint (1) which proves by the electrical examination that the muscles on the affected side are degenerated and by the studies cited by Jessen (2), which show that the nerves in tuberculosis show a neuritis. I have noted that pressure over the affected nerves will often cause pain the same as it does in cases of neuritis produced by other and well-recognized causes.

I have observed many instances of pain in tuberculosis which I believe are of the character here described. The association between the local neuritis and the involvement in the lung seemed quite clear. I desire to report briefly a few such cases :—

Mrs. B, aged 32, had suffered from a slight infection of the right apex and an advanced tuberculous process of the upper left lung which had ended in cavity formation and healing. She also had tuberculous ulcerations of the interarytenoid space and left cord, which resulted in healing. She suffered a great deal from aching of the left shoulder during her illness, and during the latter part of her treatment suffered severe pain running up the left side of the neck, which persisted, at intervals, for months and then finally disappeared.

Mr. L. consulted me in February, 1911, with a widespread ulcerative condition of the larynx. Upon examination of the chest I found an old fibroid lesion in the right lung occupying the upper portion of the upper lobe, which was the seat of renewed activity. I told him my findings, that he had evidence of an old lesion in the lung. He

protested that it could not be, so I inquired as to his reason for leaving Philadelphia, which was his former home. He said that he had left because he had suffered from a severe rheumatism of the right shoulder which partially incapacitated him for business. I asked him if he was examined. He said that he had consulted nearly a dozen of the best men there, all of whom had pronounced the case rheumatism. None had given him an idea that tuberculosis was present. During his last illness, for it proved fatal, he again suffered to some extent from the same old pains. I have no doubt that his pains were due to a neuritis of reflex origin, the cause being the tuberculous process in the lung.

Mr. G. consulted me in January, 1912, suffering from a pain in the upper part of the right chest, which at first was considered to be of pleural origin. Owing to my inability to understand the patient's language, I was somewhat deceived for a few days. I found upon examination that the major portion of the upper lobe on the right side was involved in an old chronic tuberculous process and at the apex there were signs of cavity formation. His clinical history was interesting. He had always enjoyed good health, and being a man of means, had lived well. In September of 1911, he was taken suddenly ill with chill, followed by fever, severe cough, free expectoration and hæmorrhages. The patient made a good recovery and had no further trouble until December, 1911, when the same thing occurred again. This was followed in about two weeks with the pain which I have mentioned. The patient was admitted to the sanatorium and carefully watched; the pain persisted, coming on in severe paroxysms two or three times a day, sometimes requiring morphine. It lasted from a few minutes to one or two hours at a time. It is now nearly three months since it started and it seems to be gradually becoming less severe and less frequent. The pains seem to be confined to

the brachial plexus, affecting certain branches more than others, *viz.*, the dorsalis scapulæ supplying the rhomboidei, the thoracies anteriores supplying the pectoralis minor and major and the axillaries supplying the deltoideus and shoulder-joint. Many of the other branches are also involved, but these show the greatest pain. The muscles covering the anterior and posterior surface of the upper part of the chest, the shoulder and arm are all markedly degenerated and the strength of the right arm is very much reduced.

A case of Jessen's is also interesting. A female, aged 24, with negative family history, suffered from a latent tuberculosis of the right lung with an acute lesion in the left apex. The patient complained of headache and "rheumatism" of the left shoulder, these pains extending to the spine of the scapula posteriorly and down to the second rib anteriorly. Temperature, 101.5° F. Physical examination showed weakened breathing over the left apex with fine râles on coughing.

Schmidt (quoted by Jessen) states that a sensitiveness to pressure on the part of the brachial plexus is oftentimes an indication of a tuberculous process in the corresponding lung.

One thing characteristic of the various pains in the neck and chest of tuberculous patients is the fact that they are not constant. They are influenced by the state of the inflammation in the lung often being worse when the inflammation is more acute. They are also influenced by weather conditions, being worse in damp, rainy weather than in bright weather and being more severe when the barometer is changing than when it is stable.

The importance of establishing the true relationship between these pains and the pulmonary involvement is evident, for if it can be shown that there is a local reflex

path which connects these pains with a lesion in the lung they assume at once a diagnostic value. Since I have been studying this question several patients, aside from the ones whose history is given above, have consulted me, stating that they had been treated for rheumatism of the shoulder for some time, and in whom I found a tuberculous involvement of the corresponding lung, which I believe was the cause of the symptoms. I am beginning to look upon "Rheumatism of the shoulder" as a condition associated with tuberculosis of the corresponding lung sufficiently often to call for a careful chest examination of all such cases.

Another diagnostic hint which I wish to throw out is that any pain involving the neck and chest whether it be the vague "feeling of being tired," experienced in the interscapular region, or a pain of marked severity, which is interrupted in character, being influenced particularly by weather changes, should call the attention of the examiner to the necessity of a careful chest examination. This is absolutely essential if the patient should be complaining of any symptoms indicative of an active tuberculous involvement.

DISCUSSION.

Dr. J. MADISON TAYLOR (Philadelphia, Pa.) said that the subject was one of special interest to him, and he felt that all should be personally indebted to the few gentlemen who had large opportunities for clinical observation for giving them something definite of paravertebral conditions. They had the opportunity from their observations to make statements which would enable the rest of them to get at an explanation and reach proper conclusions. It would be exceedingly interesting to have these observations from the men who saw so many cases of inflammatory conditions of the lungs. Dr. Taylor referred to the employment of pressure along the paravertebral tissues, moving back and forth, chiefly to estimate the degree and character of the local tenderness, resistance, and rigidities of tissue. This sheds much light on existing lesions of any kind,

enabling one to use the information thus gained in estimating the areas affected by inflammatory disturbances.

Judicious pressure on these areas also aids much in regulating the vasomotor action and contributes to restoration of circulatory balance in the diseased structures, prior to cures. Not only are acute derangements thus promptly relieved, but chronic states are materially helped, the *modus operandi* being different.

Dr. CHARLES L. MINOR (Asheville, N.C.): This matter of chest and shoulder pains occurring in tuberculosis of the lungs has been known for a long time, and many of us have had personal experience with them. I am glad, however, that the Doctor has again called our attention to them. We have all seen cases diagnosticated as rheumatism which proved finally to be cases of beginning pulmonary tuberculosis, such as Dr. Pottenger refers to, and therefore I think that his paper will be timely.

Dr. C. F. COLLINS (New York) called attention to the fact that in considering pain about the shoulder-joint and along the brachial plexes one must not lose sight of the fact that even slight adhesions in the shoulder-joint will often produce pains along the nerves, resembling a true neuritis. This cause of pain can easily be recognized by testing the mobility of the shoulder-joint; by passive motion breaking up these adhesions, followed by moderate massage, good results are usually obtained, and the nerve pain disappears.

Dr. R. G. CURTIN (Philadelphia, Pa.) said he had met with seven or eight cases of herpes zoster in tuberculosis of the lungs. As this disease is caused by inflammation inside of the sheath of the nerve, it is accompanied by a certain amount of irritation and pain. This inflammation of the nerve and the sheath might explain some cases of pain in the chest.

Dr. WILLIAM CHARLES WHITE (Pittsburg) said: About four years ago in the *Archives of Internal Medicine** there appeared an article by Dr. Van Norman and myself, showing a careful study of hyperalgesia in tuberculosis, calling special attention to the skin sensitiveness. This sensitiveness had a very definite relation to the extent of the active disease. It had apparently nothing to do with the pleural involvement, but was related to the lung involvement. Hyperæsthesia was not present over pleural involvement, but was limited to the lung involvement. In every case coming into the clinic they first tried to determine this hyperalgesic condition with pin-point, heat, cold. When present it was found generally to coincide with the active lung lesion.

Dr. Pottenger had spoken of the muscle pains. It seems that these muscle pains came more from healing, and were more frequent

* July, 1909, vol. iv, pp. 1-7.

as cicatrization went on. It was a later, rather than an earlier, manifestation of the tuberculous lesion. Dr. Pottenger has made no reference to the work on Hyperalgesia except in referring it to Head. Head, in no place that I know of, made any mention of hyperæsthesia in tuberculosis of the lungs. On the other hand, K. Franke,* in the past few years has repeatedly drawn attention to muscles soreness, which formed the subject of Dr. Pottenger's paper.

Dr. F. M. POTTENGER (Monrovia, Cal.) said that there are numerous regional changes of reflex origin which occur in cases of tuberculosis; for example, the skin and subcutaneous tissues become atrophied in the presence of chronic lesions. There are also motor changes which show in a spasm of the muscles during acute inflammation and degeneration after the inflammation has become chronic. Aside from these there is evidence that there is a true neuritis present. It should also be mentioned in this connection that there are many other reflex phenomena, such as hoarseness in early tuberculosis, the reflex cough which is induced by the tickling in the larynx, and the secretory changes in the stomach and intestinal tract.

Regarding the reflex phenomena which show themselves in the muscles and skin, it must be remembered that it is not the entire nerve, motor or sensory, that is involved, but certain fibres of each. This is shown by the fact that where entire muscles or groups of muscles are supplied by a certain nerve, only parts of this muscle, or individual muscles of the group, show the spasm and degeneration.

Regarding the neuritis which he described in his paper, he said that this was separate and apart from the general neuritis which is usually spoken of as being due to toxæmia and which may show itself in the nerves of any portion of the body, in that it is regional in character and affects nerves which take their origin from segments of the cord which receive the impulse from the lung. He said that while neuritis had been pointed out by others, particularly the Germans, he did not think that this regional neuritis had been pointed out as being of diagnostic import, nor did he think that its connection with the inflammation within the lung had been emphasized sufficiently to make it of any value as a symptom in pulmonary tuberculosis. He did not wish it understood that it was found only in pulmonary tuberculosis. It might be found in any chronic inflammatory condition in the lung.

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* "Beitrag z. klin. Tuberk.," 1908, 225.

SUBSEQUENT HISTORIES OF CASES TREATED DURING THE YEARS 1891-1911, AT THE SHARON SANATORIUM.

By VINCENT Y. BOWDITCH, M.D.,
OF BOSTON;

AND

WALTER A. GRIFFIN, M.D.,
OF SHARON, MASS.

This paper is the result of an investigation of the present condition of patients discharged from the Sharon Sanatorium from the time of its foundation in 1891 to January 1, 1911; that is, no patient will be reported who has not been away from the sanatorium at least one year.

In the nineteen years thus covered there have been discharged 592 cases. Of these, twenty-two stayed so short a time that they were considered not treated. Nine others were admitted for some other complaint than tuberculosis of lungs. Twenty-four did not react to tuberculin, and were termed merely suspected cases. Seventeen in the early years of the sanatorium were discharged as well, this term being used, it may be, because at that time there had been no hard and fast rules formulated by a nomenclature committee. These seventeen cases also are not considered in this report, since in practically all instances they were admitted as questioned phthisis or as bronchitis, and received no tuberculin test. This leaves 520 cases, of whom

forty-eight were discharged as not improved, 175 as improved, and 297 as arrested or apparently cured.

Of the 48 non-improved cases, all died as might be expected ...			100 per cent.
Of the 175 improved cases, 107 died			60 ,,
Condition reported good	51		29 ,,
Not traced	17		9 ,,

Some of the improved cases have continued in a very gratifying condition of health, and frequently they have arrested their disease and have taken up their life work again.

The following history is fairly typical :—

Case 190.—This patient, without any family taint of tuberculosis or previous severe illness, had had a cough for a year following an acute cold. She presented on examination well-marked dulness with harsh respiration at both apices, especially the left. Numerous fine and medium moist râles were present over the upper half of the left side front and back, and at the extreme lower base. The sputa showed tubercle bacilli. She stayed ten months in the sanatorium, and has remained in excellent condition for ten years except for an attack of appendicitis which required operation. She was a professional singer, and has taken up her work again, holding a position in a large city church.

In 1902 a report was made of seventy-nine arrested cases treated at Sharon Sanatorium.* Of these six, or 7.5 per cent., have not been heard from recently, and twenty-two, or 26.5 per cent., have been reported as dead. This leaves at least 66 per cent. of this series of cases still living after ten years, and perhaps a higher percentage if some of the six who have not been heard from could have been reached. Practically all of the 66 per cent. report that they are in

* *Transactions of American Climatological Association*, 1903.

good physical condition, and many of them are wage-earners. The following case may be cited in illustration.

Case 49.—This patient had two brothers and two sisters die of consumption. Two months before entrance she had a sudden hæmoptysis of fairly large proportions. Examination showed dulness in middle of right back with fine râles. Tubercle bacilli were numerous in sputa. She was discharged in 1894, seventeen years ago, and has remained well, although her work has been hard as a domestic in Boston, until about a year ago when she married and returned to her old home in Ireland.

As before stated, we have at this time 297 arrested and apparently cured cases to report. All who received the latter term (forty-four in number) would have been considered arrested cases according to previous method of tabulation, and for the purpose of this paper we will consider them as arrested cases. From our standpoint it is only fair to say, however, that "arrested" used to mean more to us than the present use of the term allows, for if tubercle bacilli were present at time of discharge the term "improved" was formerly the most favourable used. On the other hand, in the early years of the sanatorium a case was frequently called arrested after a shorter period of residence, even though at times only a little over a month had elapsed. Such patients had lost cough and expectoration, if any, almost immediately after entrance. They had learned the *régime* of the sanatorium, and had good home environments. In practically all such instances the after results have justified the expectation expressed by the term. According to the present nomenclature, however, certain cases have gone out as improved because of residence limited to less than two months. Numerically such cases have been as many as those who, with tubercle bacilli still persistent at time of discharge, have been called

arrested according to the present use of the term; so that for the purposes of comparison with previous reports we have counted together the arrested and apparently cured cases and called them arrested.

Of the 297 cases so classed, 25 have not been traced	8 per cent.
35 have died	10 ,,
Leaving 237 known to be alive, and for the most part in excellent health	81 ,,

In arriving at a diagnosis nearly all cases since 1902 who have not shown tubercle bacilli in the sputa have been tested with tuberculin before being pronounced tubercular. This has been done to avoid the criticism which could be advanced with some justice that occasionally patients without tuberculosis might have been discharged, thus bettering the reported results of the sanatorium. Each year there are some three or four who are sent out as "suspected" cases, but without taint of tuberculosis as ascertained by the test. It might be said, however, that all of these could at least be classed by the frequently heard but erroneous term pre-tubercular. That is to say, such patients are always debilitated and in a condition to be attacked by disease. The sanatorium care and *régime* is therefore a good thing, for it teaches such patients how to care for their physical condition, so that they are not so liable to any disease.

In our opinion the administration of the tuberculin test is not to be lightly undertaken. We remember one rather harrowing experience which may prove of interest to recount.

Case 206.—This patient had a cough for about three months two years before entrance. She afterwards began training as a nurse, and the chest was examined by chance by one of the visiting physicians, although there were no symptoms referable to chest at the time. She had dulness

over the upper half of the right lung, and medium and fine râles all over this side. As there was no sputum for examination, she was given 0.002 grm. tuberculin about two weeks after entrance. This caused a slight reaction, and as the patient seemed all right she was allowed up the next day. The temperature, however, went up a little on that day and the two days following. She was again put to bed, and was kept there for nearly eight weeks before she could be safely allowed about. A part of this time the temperature varied between 100° and 103° F. at night; and cough, which had been absent up to this time, became troublesome; the sputa containing many tubercle bacilli. This upset naturally worried us a good deal, but on further investigation it was found that on the two or three days after the test the patient over-exerted herself walking, so that to this was ascribed the upset quite as much as to the tuberculin. After discharge this patient again took up nursing, and remained in good condition for several years. She finally died of an acute hæmorrhage nine years after discharge.

Since this case we have been more hesitant in applying the test to patients who present signs of persistent active catarrh in the lungs, and there are usually one or two instances each year where we consider a patient to be tubercular because of the history and certain suspicious signs in the chest even though no tubercle bacilli are found and no tuberculin is given. The following would be a rather typical case of this sort.

Case 532.—The father and mother of the patient had died of tuberculosis about one and one-half years before entrance. Patient had had what was called "grip" with occasional cough. Recently there had been no cough or expectoration. Chest showed marked dulness over upper half of right side and at apex on left. Breathing was harsh

on right and voice bronchophonic. Medium and fine râles were heard in plenty over dull areas. Throat showed general congestion with a small ulceration on left true vocal cord, and both false cords were red and swollen. Patient had been hoarse for a year. At no time was any sputum available for examination. Such a case certainly needed no tuberculin to prove that treatment was necessary, and the administration of a test dose might have had disastrous results.

In obtaining the results nothing new or original has been used in treatment. The trinity of fresh air, good food, and rest have been the main reliance. About four years ago an experiment was made with a sleeping-out balcony. The five patients who were on this balcony did so well and were so enthusiastic that other balconies were made, until now every room has a large door through which the bed may be wheeled on to a verandah. All the patients favour sleeping out, and if, for any reason, the weather forces them to remain with half the doors closed, there is a general complaint of stuffiness and lack of air, even though under such circumstances there is better ventilation than in any ordinary room. We have concluded, therefore, that even though we cannot say in any individual case that the patient is better for sleeping out, still we feel that, all things considered, the condition of patients is so much bettered that the expense of making the balconies has been justified.

In forty-two cases tuberculin has been used therapeutically. For the most part these were not especially favourable cases, in fact, nearly half (nineteen) were considered moderately advanced, and all but four had tubercle bacilli in sputa. Of these four the signs in two extended over more than half of each lung. One of the others had definite signs in one lung which have persisted to the present time and a history of hæmoptysis. The other case

had a tuberculin reaction, and was given treatment because her home environment was poor, and it was desired to give her as much resistance as possible. Seven of the forty-two cases have died. Four of these were treated in the first years of our use of tuberculin, and would not at present have been chosen for such treatment, since they were evidently fast failing, showing temperature and rapid inroads of disease. One other of the seven who have died wore herself out needlessly by too much travelling contrary to advice, and one had a sudden hæmoptysis. One case who had tuberculin treatment has not been traced. This leaves thirty-four of the forty-two cases in good condition (83 per cent.) This seems to us a good showing considering the relatively poor condition of many of the cases, and we therefore favour the use of tuberculin in cases of open tuberculosis without fever, and, theoretically at least, we believe it is indicated in closed cases as a means of conferring something of an active immunity. Before leaving this phase of the subject it would perhaps be of interest to touch on the history of the first case who received the treatment at the sanatorium, and who has done so well for eight years that we have at times felt like giving tuberculin to all patients as a routine.

Case 243.—This patient was first admitted April 20, 1903. There were well-marked signs all over the left side of the chest, and at the top of the right. The sputa contained many tubercle bacilli. With ordinary sanatorium treatment the cough and expectoration ceased, and she was discharged at the end of eight months. Within six months she was back again with renewal of all old symptoms. With the same treatment she had received before she gained a little in the next five months, but without evidence of radical improvement. Finally she was given tuberculin over a period of five months in doses ranging from

0.0005 grm. to 0.6 grm. At first the cough and expectoration increased, but soon the condition began to improve, and for more than a month before discharge the symptoms were entirely absent, and the physical signs showed much improvement. After discharge she worked for a time in a bleachery without breaking down; at present she is a waitress in a summer hotel, and reports that her health is excellent, eight years after the use of tuberculin.

In considering again the results of treatment in this series of cases, one cannot but be impressed with the after-condition of the arrested as compared with that of the improved cases—81 per cent. of the former reporting health good, with only 29 per cent. of the latter. The oft-repeated moral is again brought forcibly to mind by these figures, that in order to give patients the best chance for recovery and for subsequent usefulness in life they should be treated at an early stage while yet the disease may be arrested. We have learned that cases are practically never cured during residence at a sanatorium; that they are merely started in the right direction. It is, therefore, fairest to them to begin treatment at a stage when they may be given the best chance to regain health.

In reviewing the work accomplished in the last twenty years, we feel that our attitude has been one of conservatism as regards results obtained. When one reflects upon the condition of affairs in the treatment of tuberculosis twenty or twenty-five years ago, and when one recalls the sense of hopelessness that was felt whenever a patient presented himself with symptoms of pulmonary disease, especially among the less favoured classes, we feel that we are justified in looking with great satisfaction, even enthusiasm, upon the work of twenty years at the sanatorium.

It is often impossible to impress upon others by figures alone facts which through long years of experience stand

as positive proofs to us of what we wished to obtain. It was never believed or even hoped that sanatorium treatment alone would eradicate tuberculosis; but it did not take long to convince us that it was a great step in the right direction, and that infinitely more could be done than heretofore to bring people back to health, even under what had been considered in former years most unfavourable conditions.

In stating our results, it must be remembered too that in using the term "arrested" we have applied it to the results obtained in many cases in which the physical signs and symptoms of disease were well marked, in spite of which condition a successful result was often obtained for a number of years. In such cases the surprising part has often been that they have remained so long without relapse upon resuming the ordinary conditions of life.

To those who have been closely connected with the work, the fact that is of far greater influence than the mere collection of figures, although these themselves have given us the greatest satisfaction and more than we had dared hope for in former years, are the faces and general aspect of patients who on reunion days at the sanatorium appear to give their tribute of gratitude for help which they have received. They give proof that they have not only been benefited themselves, but also that they have been of great influence in teaching methods which tend to prevent disease, and this is one of the most gratifying parts of all our work.

We have no sympathy with the attitude, which happily is now lessening, that because sanatorium treatment has not proved to be a panacea it has therefore failed in its purpose. On the contrary, with greater confidence than ever before we feel it to be one of the great and important factors to be resorted to in conjunction with every other known method of combating the disease which still holds the highest place in the mortality list of the civilized world.

DISCUSSION.

Dr. JAMES M. ANDERS (Philadelphia, Penn.) said that there was one point that should be remembered in connection with this subject, namely, that the sanatorium treatment did not cure tuberculous patients, but often carried them well along toward recovery. He thought that after the patients left the sanatorium we still had a very important duty to perform in instructing them how to continue a proper mode of life; if they were taught this, particularly if they were symptom-free when discharged, there would be little danger of recurrences. They should be made to understand the necessity for keeping themselves in a condition of good muscular development; a good muscular development being synonymous with good physical development, as pointed out by Friedmann in a recent issue of the *Journal of the American Medical Association.* The condition of the muscles was the standard of physical efficiency, the degree of resistance possessed by the patient. That meant that the patient, although practically well, should take systematic graduated physical exercise, and he was quite sure that if physicians would insist upon this they would be doing their patients a great service. It should be remembered that a man at exercise, *e.g.*, walking at the rate of five miles per hour, breathed four or five times more oxygen than while at rest. The so-called "internal respiration" was thereby favoured, for the exchange of oxygen and CO_2 took place in the muscles themselves. The rate of these changes stood in direct relation to the nutrition of the patient. In other words, there was no way by which one could promote the nutritive changes so well as by the employment of systematic physical exercises, alternated with sufficient rest. During exercise they were expending much more energy than they were storing during the same period; it followed, therefore, that they should be instructed to take systematic rest as well, in order to keep the muscles in a condition of nutritive equilibrium. All these patients required muscular exercise, either in the form of walking, games, or suitable work, rest, and recreation. The point Dr. Anders wished to emphasize and to maintain was, that in attempting to secure the desired resistance their efforts should be directed toward obtaining good muscular development which was synonymous with the highest type of physical development.

THE RÒLE PLAYED BY RESISTANCE IN PULMONARY TUBERCULOSIS.

By A. J. RICHER, M.D.

STE. AGATHE DES MONTS, P.Q., CANADA.

During the past ten years there has been a growing tendency towards the belief that tuberculous infection occurs during the first years of life. Clinically, the histories of patients have given this conception sufficient colouring to influence some clinicians to the partial acceptance of such a view. The work of von Behring threw a deal of light upon this subject, but unfortunately was not sufficiently conclusive to compel final acceptance. It has remained for Calmette and his collaborators to give us the conclusive proof in a series of experiments and tests performed at the Pasteur Institute at Lille, which were summarized in two contributions of his appearing in "*La Presse Médicale*," August 9, 1911, and February 21, 1912.

His conclusions may be summed up in the following manner:—

(1) Almost 90 per cent. of the children of school age react to tuberculin (cuti-reaction).

(2) The majority of implantations are of human origin.

(3) With few exceptions, the pathway of infection has been the digestive tract.

(4) Infection in early life confers a degree of immunity if the doses of infective material are not large or rapidly successive.

The resistance manifested by children suffering from pulmonary tuberculosis is an incontestable fact; the only tendency is towards spontaneous cure. Why then should this same disease in adults so frequently terminate fatally? Is it that the immunity of childhood has exhausted itself? Is it because the tissues of the adult differ so materially from those of the child? These two questions must for the present remain unanswered—but, we do know now that nearly all tuberculous subjects possess a certain degree of resistance which when raised by whatever method will bring about a cure. This much has been proved to us by Paterson, of Frimley, in his recent work,* where, by the method he exposes, even cases of chronic disease, apparently incurable, may be restored to partial if not complete efficiency.

His method of treatment is based upon this question of resistance, how it may be raised by exercise and graduated labour until fever reactions occur, which latter are controlled not simply by rest in bed, as we have been in the habit of doing, but by complete immobilization. Each such reaction is termed an auto-inoculation, which complete immobilization brings to a rapid termination with a resulting increase in resistance. This increased resistance was demonstrated by Dr. Inman, the pathologist of the Brompton Hospital (London), by means of the opsonic index made upon the patients of Dr. Paterson at the Frimley Sanatorium, and proves the soundness of this method of treatment. The increase in the labour grades is carried on until the patient is able to do a ten-hour day of navvy work without any fever reaction, when he may resume his former occupation without much fear of relapse.

This system offers the following advantages:—

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* Marcus Paterson: "Auto-inoculation in Pulmonary Tuberculosis." Jas. Nisbet and Co., London.

(1) Duration of treatment is about half what is needed for the continuous rest method.

(2) Relapses are almost *nil.*

(3) Employment during treatment prevents the breeding of discontent and apathy.

(4) Occupation of body and mind during treatment permits the patient to resume his former work untainted by the malady which the reclining chair breeds, *viz.*, disinclination for work.

(5) No special climate is required.

(6) Patients in the advanced stages of the disease have some chance of recovery. The outlook is thus more hopeful for all concerned.

(7) The work performed by patients lessens the cost of their maintenance quite materially.

If the auto-inoculation method gives such very encouraging results it is only fair to ask why not the tuberculin treatment instead?

Gradually increasing doses of tuberculin have certainly made their proof. In Germany and England it is being administered without much hesitation, and doses are reached which are more than consternating to us who have been trained to minimal dosage.

Ambulatory and dispensary treatment are made possible by the tuberculin treatment, but, while relapses are less frequent than with the rest cure, yet they occur quite frequently.

In comparing the two methods, two points are essential for consideration; firstly, among the various tuberculins used we know that these only approach in varying degrees the product of the germ as secreted in the human organism —at best they bear some resemblance to the true toxin. Secondly, all patients may *not* be submitted to the tuberculin treatment. On the other hand, the Frimley method is applicable to all cases of pulmonary tuberculosis, and the

toxine entering the circulation being the secretion of the patient's own germs is, of course, from the right source.

This question of resistance in tuberculosis will lead us much further if we allow our imagination a little freedom. If the infected child becomes the resistant adult, it must almost follow then that tuberculous disease develops in the adult more frequently because the acquired resistance is lowered or broken down than as a result of re-infection. In discharging an "arrested" case of disease, how much more often do we use the phrase "beware of excesses" as compared with the formula "beware of re-infection." Truly enough we feel that the patient who has undergone treatment in a resort has gained the fullest knowledge as regards infection, and knows how to guard against re-infection.

In taking down histories of tuberculous individuals, how frequently are we struck with the fact that the onset of the disease is nearly always accompanied by some depressing cause, mental or physical. We look upon this as a contributing factor. What if it should be the real causative factor? We have no proof at present that will controvert this view, so we diligently search for the immediate causal but elusive factor *infection*, with a view to determine the period of invasion.

The exact time when the tuberculous germ invades the organism has not yet been determined clinically. The period of incubation has not so far been the subject of even a surmise; still we go on happily dealing with the disease in the adult as if the infection or re-infection were a something of recent happening.

When dealing with relapses in the adult, do we not, as a rule, find that they are the result of lowered resistance brought about by an excess of some sort or other? Looking into the initial attack, while keeping in mind the findings of Calmette, we are justified in expressing the view that tuberculous disease may develop in the adult in the absence of the

infecting germ as coming from without. In other words, an adult may develop pulmonary tuberculosis from the germs he has carried in his system from childhood, merely by lowering his resisting power. Thus, lowered resistance may become as great, if not a greater factor than infection in the development of pulmonary tuberculosis in the adult.

1912.

LOOMIS SANATORIUM ANNEX.[1]

EXERCISE CHART.

(*Graduated Labor.*)

Name: Francis J. Rogers. Case No. 1088.

Date a.m.	Time consumed. mins.	Kind of exercise	(Immediately after) Pulse	Temp.	(After ½ hour rest) Pulse	Temp.
Feb. 15	165	Camp work and woods	†Not taken : see Note			
,, 16	90	Woods...	114	101.6	80	99
*,, 17	80	,, ...	90	101	68	99
,, 18	—	Church on hill ...	—	—	—	—
,, 19	90	Woods...	102	101.2	76	99
,, 20	90	,, ...	110	101	84	98.4
,, 21	90	,, ...	118	101.4	88	99
p.m.						
Feb. 15	100	Pick and shovel ...	110	101.8	80	98.8
,, 16	80	,, ,. ...	102	101.8	80	98
*,, 17	—	Village	—	—	—	—
,, 18	90	Walking	104	101.4	80	99
,, 19	90	Pick and shovel ...	102	101.8	80	99
,, 20	90	Woods...	100	100.8	84	91.8
,, 21	80	,, ...	110	101.4	88	99

Date a.m.	Time consumed, mins.	Kind of exercise	(Immediately after) Pulse	Temp.	(After ½ hour rest) Pulse	Temp.
Feb. 22	—	Washington's birthday—very stormy				
,, 23	90	Woods...	102	101.2	80	99
,, 24	90	,, ...	104	104 4	80	99
,, 25	—	Church on hill ...	—	—	—	—
,, 26	90	Woods...	102	101·2	76	99
,, 27	90	Walking	104	101.6	80	99.6
,, 28	120	Woods...	110	101.4	80	99
,, 29	120	,, ...	98	100.4	72	98.7
p.m.						
Feb. 22	—	Washington's birthday—holiday				
,, 23	80	Pick and Shovel ...	104	101.6	84	99
,, 24	—	Village...	—	—	—	—
,, 25	60	Walking	90	100	70	98.4
,, 26	80	Sweeping snow ...	100	100	80	98.6
,, 27	—	Resting in camp ...	—	—	—	—
,, 28	120	Woods...	104	101	80	99
,, 29	120	,, ...	98	100.6	76	98.8

[1] These charts were exhibited by Dr. King in discussing Dr. Richer's paper.

Date a.m.	Time consumed, mins.	Kind of exercise	(Immediately after) Pulse	Temp.	(After ½ hour rest) Pulse	Temp.
Mar. 1	150	Cleaning camp—not taken				
*,, 2	120	Woods	90	100.2	76	98.8
,, 3	—	Church at Main San.	—	—	—	—
,, 4	110	Woods	102	101.4	72	99
,, 5	120	,,	98	100.8	68	99
,, 6	120	,,	96	100.8	76	98.8
,, 7	110	,,	96	100.6	80	98.8
p.m.						
Mar. 1	100	Woods	92	101.2	76	98.8
*,, 2	—	Village	—	—	—	—
,, 3	120	Walking	108	101	76	98.8
,, 4	100	Woods	100	101.6	78	98.8
,, 5	100	,,	96	100.4	76	98.6
,, 6	110	,,	96	101	72	98.6
,, 7	100	,,	98	100.8	74	98.8

Date a.m.	Time consumed, mins.	Kind of exercise	(Immediately after) Pulse	Temp.	(After ½ hour rest) Pulse	Temp.
Mar. 8	110	Pick and Shovel	100	100.6	80	98.6
*,, 9	100	,,	92	100	72	98.6
,, 10	—	Church at Main San.	—	—	—	—
,, 11	120	Woods	110	101.8	80	98.8
,, 12	110	,,	104	100.8	76	98.7
,, 13 Diet table	90	Pick and shovel	110	101	80	98.8
,, 14	120	Woods	98	101.8	76	98.6
Feb. 14 †(examination)						
p.m.						
Mar. 8	110	Pick and shovel	104	100.8	76	98.6
*,, 9	—	Village	—	—	—	—
,, 10	100	Resting in camp	—	—	—	—
,, 11	100	Woods	104	101	80	99
,, 12	‡60	,,	100	100.6	76	98.6
,, 13 Diet table	100	,,	112	100.6	80	98.6
,, 14	110	,,	98	101	76	98.8

This Chart must be kept by the patient and handed in at the week ends.

Exercise must be taken unless excused by the physician.

In case no exercise is taken indicate by an X in the space headed "Kind of Exercise."

Keep this blank clean.

REMARKS.

* Tuberculin—Minimum : dose —.0047.
"B.F." Maximum : ,, — .032.
† Called for examination, before resting.
‡ Rain.

Body weight in kilos : February 15—58·K net.

March 15—

Temperature and pulse range—29 days.

Maximum—pulse 118. Maximum—temperature 101.8.
Minimum— ,, 68. Minimum— ,, 98.4.

DISCUSSION.

Dr. HERBERT M. KING (Liberty, New York) said: We are all interested in any therapeutic measure applicable to the treatment of tuberculosis. The employment of physical exercise as a therapeutic measure, however, is not particularly new. Exercise-therapy was employed in tuberculosis many years ago. English physicians utilized the method a century or more ago. To Paterson, however, belongs the credit of systematizing exercise therapy by means of a carefully graduated increase in amount and change in character of prescribed exercise for the purpose of producing and controlling auto-inoculation, and under Paterson's excellent system and careful supervision the results are decidedly beneficial, whether they be due to auto-inoculation by the patient's own tuberculin or to some other cause.

The principal points to be considered in the employment of such a measure are, first: the establishment of safe criteria by which to regulate the dosage; and second, the proper selection of patients. As to the regulation of dosage, Paterson regards the following as the chief points to be observed:—

1st.—Temperature reactions.

2nd.—Amount and quality of sputum.

3rd.—Patient's weight.

4th.—Appetite, and

5th.—The patient's own feelings.

To these should be added, it seems to me, any change in character or extent of physical signs, although Dr. Paterson lays little stress on this point. Whether exercise be prescribed in the form of walking, &c., or in that of manual labour, a more or less frequent physical examination will often indicate an increase or decrease in dosage, where other indications are lacking. The opsonic index is impracticable and no more reliable as an indication for dosage in exercise than in tuberculin therapy.

As to the selection of patients, it is a safe rule to follow that any patient suitable for tuberculin therapy is particularly suitable for exercise therapy, and, as in one case so in the other, it will frequently happen that, notwithstanding apparent suitability, treatment will have to be discontinued, and in the case of exercise the patient placed upon rest, more or less absolute, according to circumstances. So far as any form of exercise is concerned it should be the universal rule that a preliminary period of rest be advised, the duration of which must, of course, be determined by the condition of the patient. In the presence of fever, immobilization as complete as possible should be practised, and the same precaution should be taken in the event of any considerable hæmoptysis, acute pleurisy, or other complication. I have not found, however, that occasional blood-tinged expectoration need be seriously considered or made to interfere with prescribed exercise.

Unfortunately, in this country where manual labour has been intro-

duced as a substitute for walking and other non-productive exercises, it is too often considered from an economic standpoint. This is decidedly an unwise thing to do. As soon as any therapeutic measure is adopted for the sake of economy, especially in institutional practice, it is doomed to failure.

In the treatment of tuberculosis, especially in the institutional care of this class of invalids, there are two chief desiderata—first, the bringing about of an "arrest" of the disease process; and second, the restoration of working efficiency. There is no doubt, I think, in the mind of anyone who has employed graduated labour as a therapeutic measure that it comes nearer fulfilling the requirements, at least so far as restoration of working efficiency is concerned, than any other method at present available. In the employment of this method at Loomis Sanatorium, after some preliminary training it is found that patients are perfectly competent to keep their own records. The sputum is measured daily, and the character noted in each case by a trained nurse. The pulse and temperature record is kept by the patient himself. These, by means of an occasional control, are found to be very accurate. The chart presented is one taken from our records. As you will see it is very complete, and is a fair sample of those which constitute our exercise records at Loomis. You will note the temperature rise *immediately* following exercise. This is physiological, and will occur in any healthy individual under similar physical exertion. The second temperature, taken *after one half-hour's rest*, is that which determines the character of the reaction. These temperatures are all rectal, and 100° F. is considered the maximum normal. In fact, a temperature failing to fall below 100 after one-half hour's rest is considered a sufficient reason for reducing the amount of, or discontinuing altogether, the exercise. It would indicate "excessive auto-inoculation," according to Paterson.

Dr. J. H. PRATT (Boston, Mass): Paterson deserves credit for showing that many consumptives with quiescent or "arrested" disease can do hard manual labour without any apparent ill effect. Attention should be called to the careful supervision by Paterson of the patients that are taking graduated exercise. Furthermore, no one has been more insistent upon absolute rest while there is fever or malaise. In his published writings the emphasis, however, has been placed on exercise rather than on rest, so that many have been misled and much harm has resulted.

In studying the results obtained by Paterson, it should be remembered that all his patients at Frimley were selected from those who had been at least three months in the Brompton Hospital. He was then dealing with patients who were in a very different condition from those admitted to American sanatoriums. The Frimley sanatorium is more properly classed with those institutions which are devoted to the "after care" of tuberculous patients. I have had patients who, after three or four months of the rest treatment, have returned to

their former employment in a shop and remained well, but I did not make the mistake of regarding the work in the shop as the means of cure.

Lawrason Brown has recently compared Paterson's statistics with those obtained at the Adirondack Cottage Sanatorium, and the figures indicate that the permanent results may be better at the latter institution.

In ascertaining whether rest or exercise should be used in the treatment of tuberculosis, facts and not opinions should be sought. In a paper published last year in the *Journal of the Outdoor Life*, I showed that those who employed the rest treatment had obtained a far higher percentage of recoveries than those who used exercise during the active stage of the disease.

In studying this question attention should be paid not only to the condition of the patient when he leaves the sanatorium, but the length of time he remains well after his discharge, for it is the ultimate results that are the most important.

It is evident from the records Dr. King has shown that he is making a careful scientific study of the effect of exercise, and in a short time he should be able to furnish instructive figures.

The excellent results that we have had in the Emmanuel Church Tuberculosis Class, despite unfavourable conditions, are certainly largely due to the strict rest treatment that has been followed. In brief the results are as follows: Seventy-five have graduated from the Class with the disease arrested and wage-earning power restored. A report completed on June 10, 1912, shows that of this number sixty-seven are well at the present time. The length of time since returning to work ranges from three months to six and a half years, with an average of three years. Four deaths have occurred among the seventy-five "arrested" cases. One of these died of labour pneumonia, three died of tuberculosis. Four of the graduates relapsed, and were admitted a second time to the class. Of the seventy-five patients who recovered, thirty-three were in the first stage of the disease on admission to the class, twenty-nine in the second, and thirteen in the third. Twenty-seven deaths have occurred in the class, all among members who on admission were unfavourable cases. Twenty members were sent to sanatoriums or hospitals after being in the class varying lengths of time. Eleven left the class owing to removal from Boston. Eleven were discharged for disobedience; all improved. Fourteen left the class against advice; nine improved, five unimproved. The number of present members is twenty-three; this includes four graduates in whom symptoms of the disease have recurred. The total number of cases treated is 158, excluding the present members.

If the patients referred to other institutions, and those discharged for disobedience, and those who gave up the treatment against advice, and those who moved away from Boston, numbering in all fifty-six, are deducted from the total number, 102 patients remain who followed

the rest treatment faithfully in the class. Of these seventy-five, or 73.5 per cent., recovered.

Has anyone using the exercise treatment, even under the most favourable climatic and hygienic conditions, obtained results as good as these?

My experience has taught me that during the active stage of the disease the consumptive should be in bed out of doors. Even when the temperature is normal and the pulse slow I keep my patients at rest until I believe the disease is arrested. Then I begin with graduated exercise, and the amount of exercise is rapidly increased.

I am glad to learn that others in this Association are coming to occupy the same position in regard to the curative value of rest and the danger of exercise.

Lawrason Brown, in an article that has just appeared in the *Journal of the American Medical Association*, says, that if he had to begin treatment to-day for tuberculosis he would go to bed and remain there for two months, whether symptoms were present or absent.

Dr. HUGH M. KINGHORN (Saranac Lake, N.Y.) said that the question of rest and exercise in the treatment of pulmonary tuberculosis was of great importance. First of all exercise in the form of walking was employed by all lung specialists when the patient, in the opinion of his physician, was in a suitable condition to walk. It was a matter of judgment with each physician how much or how little walking exercise his patient should take, and it was also a matter of judgment at what stage in the patient's treatment he should begin to take such exercise. When, however, labour was combined with walking exercise as an essential factor in the treatment of pulmonary tuberculosis, then there was a wide diversity of opinion among lung specialists.

They would remember that Marcus Paterson, of Frimley, England, said that rest and exercise were completely interwoven in the treatment of pulmonary tuberculosis by auto-inoculation. He used the term auto-inoculation to describe a process. This process was the introduction of bacterial products into the blood. In the process were introduced all degrees of rest and activity, from complete immobilization to heaviest labour. As he understood Paterson's treatment, the aim was to induce auto-inoculation and to restore the physical capacity of the patient. It was an interesting fact that the aim of the hygiene-dietetic treatment of pulmonary tuberculosis, as taught by Dr. Trudeau and the Germans, was directly opposed to this auto-inoculation theory. He was not aware that there was any proof that these auto-inoculations were of value.

Paterson, together with Inman, used the opsonic test to prove auto-inoculation after exercise. Dr. Kinghorn wished to state that this tuberculo-opsonic test had been proven both by Dr. William H. Park and by them at the Saranac Laboratory and by others to be practically of no value.

It seemed to him that this question of labour in the treatment of pulmonary tuberculosis was one of considerable risk, and he wished to strike a note of warning against its general adoption. He thought that they would agree with him that patients were placed under treatment for phthisis because they had symptoms of active disease. The aim of the physician at this time was to cause a cessation of these symptoms and to try to get his patient into a staple condition and to avoid these auto-inoculations. A considerable period of time was necessary to produce this staple condition, and then a considerable period was necessary to fix this condition so that there would be no return of symptoms. Then the patient was put on walking exercises, beginning with a few minutes each day and gradually increasing. The object of the period of rest was to cause cessation of symptoms, and the object of the exercises was to tone up the patient. It was not a question of causing auto-inoculation or of seeing how much work the patient could do, but it was a question of causing a disappearance of symptoms and of signs of the disease from the lung.

In conclusion, Dr. Kinghorn merely wished to say that the open-air plan of treatment as practised by Brehmer, Dettweiler, Trudeau, and Vincent Y. Bowditch had stood the test of time and had obtained brilliant results. Each year they had more success in its employment because they used the great principles of rest, fresh air, and food, with greater care.

Dr. William Charles White (Pittsburgh) said: It is a pity that exercise has been elevated to the dignity of therapy in tuberculosis. The thing that seems clear to me is that exercise is not a therapeutic agent in combating the tuberculous process. It is the one thing we avoid as long as there is any clinical symptom of activity. There comes a time, of course, in the progress of every patient who recovers, when he can be allowed exercise. This amount of permitted exercise increases as the patient gets well; but it seems to me a grave mistake to confuse this permission of exercise with an idea of therapeutic use against the tuberculous process itself. I have carefully watched the arguments for this view and they seem just as insecure as the tuberculo-opsonic index itself.

Until we have a safer way of regulating permitted labour I feel sure there will be many an avoidable downfall of tuberculous patients treated on the basis of graduated labour. This is the attitude I took three years ago in Washington, and it is a pleasure to hear the criticism of work as a therapeutic agent. I think Dr. Pratt has mentioned in a very striking way the evil which may follow graduated labour.

Dr. J. N. Hall (Denver, Colo.) said that the subject under discussion interested all of them, especially when it concerned the recovery rate among physicians afflicted with pulmonary tuberculosis. His own work was mostly in the private treatment rather than the sanatorium treatment of the disease. In Denver there were many physicians

suffering from pulmonary tuberculosis. He was struck by the fact that so many of them made such excellent recoveries. The recovery rate among physicians in Denver was certainly good, and he often had been impressed with that fact. One or two years ago he was interested in looking up the records of the recoveries among physicians to compare with the records of those who were not physicians. He had reported the cases of 100 physicians under his care. Thirty-one made complete recoveries and went back to their usual business and followed it in their usual way. He had an idea that physicians would give a better recovery rate than others. He believed that being physicians they recognized their condition earlier and came early enough to be properly cared for.

Dr. CLEAVELAND FLOYD (Boston, Mass.) called attention to the amount of pulmonary disease occurring among children, and thought it was not realized by many. Some observations he had made showed that from 30 per cent. to 60 per cent. of the children exposed to the disease in the home were infected. Children seemed to offer a greater resistance to the spread of the disease and more often brought about an arrest than adults.

Two factors taking part in this were auto-inoculation and the activity of the lymphatic system. Many children systematically run a little temperature which is probably explained by auto-inoculation.

In the infected guinea-pig, enlarged and lymphatic glands are very constant and probably aid in the protection of the animal. The activity of the lymphocytes and lymphatic glands is also true in children.

In the discussion in regard to rest and exercise in the treatment of tuberculosis, the great question was at what time was rest required, and when exercise. This had to be decided by the physician in every individual case. The Arneth blood picture, when used intelligently, was often of considerable aid and often gave evidence of excessive absorption of over-exercise before this was noticeable from clinical symptoms or signs. If tuberculin was being used the same held equally true.

The determination of the severity of the tubercular infection was also of great importance in this connection. This could be accomplished by the isolation of the tubercle bacillus by the antiformin method, its cultivation on glycerine agar and its inoculation into guinea-pigs. In the more virulent infections more rest and less exercise would naturally be required.

Further work along these lines might hold out important results.

Dr. CARROLL E. EDSON (Denver, Colo.) said that rest and exercise, which were so successfully employed as a therapeutic measure in the treatment of pulmonary tuberculosis, belonged to the art rather than to the science of medicine. No person who was interested and who was enthusiastic over the problems of bacteriology and biochemistry could fail to consider the variations of auto-inoculation as established

facts. Some, however, were working these variations into a whirl of speculation. Through their enthusiasm they sometimes forgot certain clinical problems that confronted them. Nor should they lose sight of the histology of these cases. The formation of scar tissue took time; its formation began from the inflammatory exudate that was thrown out, and this could not take place in a day or a week. The mere subsidence of the fever did not mean scar formation.

Dr. Guy Hinsdale (Hot Springs, Va.) thought that there were one or two criticisms to be made regarding some of the work done in this country. The cases at Frimley were chosen only after long periods of observation in the Brompton Hospital in London, and after having had a great deal of rest. When a patient was received at Frimley he was placed in bed and kept there three, four, or five days, according to the necessity of the case. Then they gradually introduced the exercises. Walking was indulged in, many knitting while they walked; some carried little toy baskets, and it looked like child's play. But what exercises were given were carefully graded; soon they were given larger baskets, then the hoe, then the pick, the shovel, and so forth, the amount being gradually increased. The women were treated in the same manner. The economic feature of this plan of treatment was wholly secondary.

Paterson's influence over his patients was truly wonderful. Any man or woman guilty of some infraction of the rules was taken from work one, two, or three days, just as soldiers are sent to the guard-house. They felt is as a disgrace, a hardship.

The fault Dr. Hinsdale said he might find with this plan of treatment was that the cases were not always properly selected, gradation was not properly given, and in many institutions work was provided for economic reasons.

Dr. Lawrason Brown (Saranac Lake, N.Y.) said he was very much interested in Dr. Richer's paper. In the struggle against pulmonary tuberculosis it took time to combat the disease, and too little time was given, as a rule, to raise the resistance of the patient who had been exposed. It seemed as if no systematized attempt had as yet been made. The new tenements in New York City were designed more especially for families which had had one or two tuberculous patients. The remaining members had been exposed, possibly infected, and these East River homes would raise the resistance of such individuals and possibly prevent the development of the disease. Giving resistance to the individual would do more to stamp out tuberculosis than any direct attack upon the tubercle bacillus. Infection with the tubercle bacillus may raise the resistance of the individual, but this had not yet been proven, at least, not to Dr. Brown. He believed in using a little reservation before accepting such statements by Calmette and others. With regard to the statement that graded exercises were better than the use of tuberculin, he doubted it.

As to Paterson's patients not relapsing, he believed that they did

relapse. They have been watched for too short a time; one could not tell the results of treatment in one, two, or three years, one must wait longer. In his book he refers to 200 and some cases that were discharged three years before. For comparison, Dr. Brown took the cases that were discharged from the Saranac Sanatorium during the same period. Paterson had a different way of selecting patients, and he got cases that were more carefully selected than usual. He cared little whether or not extensive physical signs were present at the top and bottom of the lung, or even cavities, provided they passed the test successfully. This test was a study of the opsonic index before and after exercise. From Paterson's results one must look upon the opsonic index in a favourable way, but a great deal depends upon the man doing this work. The number of cases that were able to work and who were at work, when the figures were compared, was in favour of theirs. His patients, however, might have been worse than theirs.

With regard to the temperature recorded immediately after the patient returned from his exercise, even well people when taking vigorous exercise might run a temperature up to 105°. One man he recalled won a race and his temperature ran up to 105° and did not return to normal for twelve hours afterward. In the cases recorded on the chart the temperature returned to normal in a short time, a rectal temperature of 99.5° after one half-an-hour's rest.

Dr. Brown said he was interested in what Dr. White had said about auto-inoculation being of some danger. Dr. White used tuberculin in such doses that the patient was constantly on the verge of reaction. This could certainly be compared with auto-inoculation. Personally, however, he did not think he had any right to speak about this, because he had not had sufficient experience with it.

Dr. Brown kept his patients quiet. He did not use exercise for auto-inoculation, but with the purpose of getting the patients ready to resume their former occupation. He considered the workshop a blessing, and the patients were put to such work as would develop the muscles usually involved and those that they would use in their future work. The effect of the workshop in reducing the amount of sputum was remarkable.

Personality counted as much in a sanatorium as in running a class. He knew of no man connected with the sanatorium work who was so closely in touch with his patients as was Paterson. He dished out their food, both for men and women. He noted also the number of times the patient expectorated.

With regard to auto-inoculation from exercise, he believed that all patients were auto-inoculated. With regard to beginning exercise, he thought the wisest thing to do was to have them exercise to-day, next day keep quiet, next day exercise, and so on. If tuberculin was used, order no exercise until the late afternoon the day after. Something

may happen when the patient exercises immediately after taking tuberculin.

Dr. CHARLES L. MINOR (Asheville, N.C.): I was much interested as to what Dr. Brown stated as to the difference between the effects of exercise and tuberculin. Exercise, in my opinion, can be more delicately graded and guarded than can the tuberculin. I have never seen properly controlled exercise have the bad effect which I have at times gotten from the most careful doses of tuberculin in unduly susceptible patients.

I am not able in my practice to employ exercise in the way Dr. Paterson does at Frimley, by putting them to work with shovels and spades and baskets, &c. In the place of this, for fifteen years I have used graduated walks, starting the patient with one, two, or five minutes' walk, and increasing by definite quantities daily, using the watch always as a guide. In this way I am able gradually to work up my patients from very short walks to long ones without any harmful effect, but on the contrary a very beneficial one, and doubtless at the same time immunizing them in the way that Dr. Paterson points out.

Dr. A. J. RICHER (Montreal, Canada) closed the discussion by saying he was delighted that the paper was not presented as an after-dinner speech. The method advocated, he said, was not his. Any system of treatment deviating from traditional lines was bound to arouse hostile criticism as well as interest. Criticism, however, was a good sign. He had taken the same views as taken by those present, and he felt gratified. It had taken him four years to change these views.

There were some points regarding the treatment that had surely escaped their attention, and he said he could not see how it could be so. Paterson's treatment was based on resistance, a point that they all seemed to have overlooked. It was useless to express his views to those present, for they were all familiar with them. He advised that they read Paterson's book, and even then they might remain unconvinced unless the work done at Frimley were investigated. But when one approached, examined, analyzed the work on the ground, looking at it from his view-point, one would feel quite differently. He said this with confidence. He referred them to Paterson's published work, the reading of which would correct many impressions regarding the application of the treatment There was no doubt about it, the system as practised in England was not applicable here in unmodified form. Any method worth while could be adapted to the needs of a nation, or to their particular habits. If the system itself was worth while it could easily be made adaptable to the needs of this country.

With regard to results, he said that he had lived to an age when he looked upon statistics as pampered gossip. He looked at facts, not as presented numerically, but as a living testimony.

SANATORIA AND HEALTH RESORTS AND THE GENERAL PRACTITIONER.

By THOMAS W. HARVEY, M.D.

ORANGE, N.J.

The general practitioner approaches the subject of sanatoria and health resorts from an entirely different point of view from that held by the consulting specialist or the health resort physician. The latter may be considered a special pleader for the advantages of the resort, and the general practitioner will be equally prejudiced in favour of home treatment, while the consulting specialist ought to occupy a position of equipoise, able to weigh the advantages and disadvantages of each method of treatment.

It has been my good fortune to hear and to read the valuable papers that have appeared before this Society for over ten years, and while we have heard at intervals from the supporters of the home treatment of consumptives the great majority of evidence has been written from the point of view of the health resort physician. I am, therefore, asking your attention to a few thoughts from the practitioner's standpoint. I do not care to consider the question as regards phthisis pulmonalis solely, for there are many diseases that are benefited by changes of climate and environment. I am convinced that these two words should not be separated in our consideration of the subject.

The home physician receives too often from his colleague, in the very centre of the ideal climate, a letter to this effect :

"I am advising your patient to return home. He is receiving no help from our climate. He is homesick." This phrase is often euphemistic and indicates the prognosis, but it is a fact that a patient frequently does not receive benefit from the climate because of the condition of his mind due to anxiety, financial worry, or true nostalgia. This fact suggests very important factors to be considered in deciding the question of sending a patient away from home for a cure, and in choosing the special location, such a procedure having been determined upon.

There are various ways of classifying patients besides the classification based upon diagnosis. One classification in this connection is based upon their pocket-books.

(1) The destitute.

(2) Those who can live comfortably at home, but have little or no surplus for luxuries.

(3) The over-rich, who have never to consider the expense of anything.

The destitute and the over-rich are well supplied with sanatoria and health resorts, but the great mass of people, the people who bear most of the burdens of this country, notwithstanding the prevalent idea that on labour alone rests the burden of the world, the people who relatively pay the heaviest taxes, the people from whom the physicians receive their principal support, who, as a rule, prefer scientific medicine to quackery or quasi-religious mummeries, these people are not supplied with sanatoria, or with opportunities for enjoying the advantages of health resorts. The State helps out the destitute. The health resort is easy and useful to the rich patient. This is one of the criticisms that occurs to the practitioner early in his study of the subject.

The advantages of a favourable climate are often not within the reach of the great majority of people, except

associated with disadvantages dependent on a lean purse that entirely counteract the effects of the beneficent climate. How many eastern consumptives have starved in the midst of the wonderful climate of Colorado; starved in many senses of the word, in mind, body, and soul.

It should be possible for people in moderate circumstances to take advantage of the curative effects of treatment by the proper use of favourable climates without having to consider the cost too closely, or to undergo long expatriation from their home and loved ones. There is no antitoxin even in pure air and lovely scenery for the toxin of loneliness.

Another classification of patients worthy of consideration in discussing this subject is founded on the varying temperaments of people. The selfish egotist who goes through life living off other people can go to a health resort with benefit. It matters not to him the sacrifices imposed on the rest of the family consequent upon his absence. But to the man who has sacrificed himself all his life for the sake of his family, when he finds himself banished from home to a health resort or sanatorium, and knows that his family are suffering deprivation, not only because of the loss of his earnings, but also on account of the expense of supporting him in his new home, to such a man anxiety and worry more than counterbalance any benefits that he may receive from the most beneficent climate.

I have always felt that too little attention is given to the value of occupation for the visitors at health resorts. The general practitioner sees much of the ill-effects of idleness in the homes of his families, and knows that much of the neurasthenia that seeks relief at the health resorts is due to the effects of objectless lives. In addition to a *régime* of diet and of exercise there should be a *régime* of occupation, something besides sport to occupy the mind, and something

that may be utilized by the patient not only for the good effect that useful work has on the mind, but also for the benefit that the opportunity for earning something towards his own support will have upon his courage and determination to recover.

A large amount of disappointment that comes to patients seeking health away from home arises from the ignorance on the part of the practitioner of the conditions prevalent at a given health resort. Such ignorance has sent many victims with bad hearts to elevated regions by express train, who if they were going there at all should have gone there by ox team. This is more important than may at first appear. To my mind a patient with phthisis will derive more benefit and take fewer chances of dangerous accidents if he is going to live at a five thousand feet elevation, if he will take weeks or even months to reach the high altitude. I would send him to Colorado by way of Texas and New Mexico, instead of by fast express by way of Chicago or St. Louis. This effect of elevation, even when within the limit of our eastern resorts, twelve hundred to two thousand feet, is often noticeable when our patients are transferred quickly from the sea-level. Many unsuspected circulatory defects are discovered or emphasized that would have been avoided if the change had been more gradual.

The most serious effect of life at sanatoria and to a lesser degree at a health resort is the effect upon the patient himself; it places him in a condition of expectant attention; it concentrates his thoughts upon himself; it exaggerates his ego; he is devoting all his energy, mental and physical, to his own betterment; he is continually discussing with himself, his doctor, and his neighbours the little changes of symptoms that he is trained to be looking for by the *régime* of the place. The thermometer and the scales become an incubus that weighs him down and destroys that spontaneity

of action that is most essential to healthful mentality. "Come down the lane to see the sunset, it will be fine to-night." "No, I am up a half degree to-day and did not gain an ounce; I must not take so much exercise." This conversation is no exaggeration. A climate that has such an atmosphere will do little good to the sick.

That functional disturbances of an organ are common sequences of certain mental attitudes toward that organ is a common observation in neurasthenia and hysteria. That organic disease may follow long-continued functional disturbances of the circulation of a given organ may not be easy to prove in accordance with the criteria of exact science, but it is a clinical observation not to be ignored.

With all due respect to our prejudices against mental healing there are a few facts one must consider most seriously. One can by "taking thought" dilate the capillaries of the skin; the phenomena of blushing may be induced by conscious thought; it is but a step to using the will for the same purpose. If the circulation of one organ can be affected, why not the circulation of another organ by direct mental attention? The path to the stomach is not quite so direct, but we know that its circulation and secretions are very susceptible to the influence and largely under the control of the senses and of the emotions. The heart is very responsive to mental conditions. For instance, the following is not an unusual sequence. There has been a sudden interference with the rhythm of the system, mayhap a disarrangement of the molecular activities of a nerve centre; we know not as yet the details of such disturbances. A shock, a grief, a disappointment, a sudden relief of tension, or any great revulsion of feeling upsets the equilibrium. After a time the outward evidences of the disturbance disappear, but the effect upon the subconscious mind seems to be ineffaceable, and if we inquire we find a long history of minor symptoms

often unobserved by the patient, showing irritability of the nerve centres, disturbances of function, and defects of nutrition, and eventually we have the local lesion of an arterio-sclerosis, a chronic infection such as endocarditis, arthritis, neuritis, or cancer. The expression "He was never the same again" is a truism applicable to us all.

It has probably been the lot of most of us to have an attack of sudden rage, due possibly to some cause which may have made it justifiable. Have you ever observed the effect upon the circulation? We have the dilated capillaries, the red face, and the heat of skin, but we are also conscious of increased rapidity of the heart.

Palpitation.—This will last some time and leave a tired exhausted feeling after it. The same phenomenon occurs in fright. Some years later we find an intermittent pulse. "Ah!" we say, "an unobserved myo- or endocarditis," but it may not be so. It is more likely that the nervous machinery of the heart has been going wrong ever since the attack of rage.

Your attention is called to these profound effects of insults to the nervous system, because I feel that we have in the life at sanatoria and at health resorts an influence capable of affecting the nervous system as potentially for evil as for good, and that it is within the possibilities of such an influence that the symptoms of a functional nature may be deepened into those of an organic nature; and, on the other hand, by a proper environment and regimen the habit of encouraging functional disturbances by constantly looking for them can be corrected, and the path of disease be turned upward and not downward. It is the physical effect of a persistent mental attitude that we charge to the account of the sanatorium, because the whole life of the place is one devoted only to the personal feelings of the patient. His entire being is wrapped up in

the selfish idea that every moment, every act means something in connection with his symptoms.

These facts as to the effect of mental states upon physical conditions are of very great importance in the problem of the probable value of sanatorium treatment, or a visit to a health resort, and should be constantly in the mind of the general practitioner. We see so many people contented to enjoy poor health under the kindly influence of the lazy life of health resorts that we are often inclined to doubt their real value in any case.

The expensive and luxurious health resort undoubtedly has come to stay, and will be always well patronized by those who really only use them as a place of amusement; but there is great need for institutions or resorts where for a moderate sum people of the middle classes, who are in need of the advantages obtainable from a short stay in a favourable climate, may be accommodated without great expense, places adapted to use and comfort, where unnecessary luxuries are not provided. Such places should be easy of access, and a part of their equipment should provide for means for light employment for those capable of it.

To make such institutions of the greatest value to those in need of such treatment resident physicians will have to pay particular attention to the mental tendency of each patient. One person will constantly need such a *régime* as will take his attention from his real or fancied disability, and another will have to be restrained from too great activity, physical or social. Above all, many patients must be guarded from too general application of the particular methods of cure that may be peculiar to the individual institution. Too often courses of baths or of apparatus or exercises are administered indiscriminately to patients without regard to their respective needs, and who are treated simply because they are present.

As a part of the training at all well-regulated sanatoria for tuberculosis it is generally taught that it is not good form to cough, and it is remarkable how influential such teaching is. It should be a cardinal rule of life at all health resorts that symptoms should not be discussed, that ailments should not be the subject of common gossip, that the "organ recital" so popular on the hotel piazzas of such resorts should be suppressed. Such things should be considered bad form.

There is one abuse that is said to be prevalent abroad in connection with health resorts that I do not think is found to any great degree in America, and that is the commission to the referring physician. Let us hope that this species of graft will never find a favourable soil for growth among our people.

It may seem that these small details are not important enough for such a dignified body as the Climatological Society to consider, but if the problems of climate are to be studied by us it is important to consider the causes of the frequent failures, and it must be remembered that it is the failures that come back to the general practitioner.

ON SOME RECURRENT FEBRILE ATTACKS IN CHRONIC TUBERCULOSIS.

By CARROLL E. EDSON, A.M., M.D.
DENVER, COLORADO.

During recent years the therapeutic attention of the phthisiologist has been directed chiefly to the use of the tubercle bacillus, or its products, for the cure of pulmonary tuberculosis. Important and interesting as these may be, there are still many problems in the care of patients with chronic tuberculosis which involve other factors than the tubercle bacillus and its histologic works. The physician must be alert to these factors if he wishes to do the best for his patient, and not be led to the narrow vision of a tissue process rather than to seeing a man with a disease.

It is for this reason that I venture to ask your attention very briefly to a phase in the management of cases of chronic tuberculosis which I have found of interest, and which I have so far not seen mentioned by any writer. My observations are purely clinical, and without laboratory argument. Quite possibly you have all recognized the condition yourselves, and can confirm my interpretation of it. Should it by chance be new to any of you, I think it may be of some help in the tedious management of these cases.

We all know the tendency of patients to attribute every access of fever or cough to "taking cold." The man who has always done well till just the few days prior to each visit, when he "took a little cold," is well known to us all.

Carelessness, neglect, over-doing, or the unpreventable progress of the disease, are alike unrecognized by him, and the symptoms of renewed or increased activity of his disease attributed wholly to a supposed insignificant cold. The physician knows better, but because of this knowledge is at times too prone himself to refer every access of fever, every increase of cough or expectoration, to an extension or lighting up of the tubercular process. The patient's error results, especially if carelessly concurred in by the physician, in his continuing an active life and bodily exercise at a time when for every reason he should be quiet, or even in bed.

On the other hand the physician, too closely thinking of the tubercle bacillus, may misinterpret these occasional periods of fever, and, convinced rightly of the importance of absolute rest during an active tubercular invasion, keep his patient unnecessarily confined, and view the case with too grave a prognosis.

To separate clearly and surely the symptoms and signs due to an intercurrent or non-related process from those due to the chronic and underlying disease is as important as it is frequently difficult. For a number of years I have been studying a type of case which presented this difficulty, and which for some time I failed to appreciate correctly.

A patient with a chronic pulmonary tuberculosis, usually fairly extensive, gives a history of having repeated attacks of fever. He says—for I have found more of these cases in men—that he takes a cold, has fever, cough, some increase in expectoration, and goes to bed. His fever lasts from a week to ten days, or more, and gradually subsides. He has been kept quiet for a few days longer to ensure quiescence of the activity, and then allowed to get up. Shortly afterwards he begins over again, and in a few weeks is back in bed with a repetition of the attack. Casually considered, the picture is one of frequently renewed activity, and the patient

becomes despondent at his failure to progress or maintain his gain. In the hurry of the physician's daily work these attacks are not carefully studied and compared each with the preceding ones. When this is done a certain number will be found to have quite another cause than that of tubercular reactivity. Careful examination shows, first, that while the patient has fever—usually moderate, though occasionally as high as 102 in the evening—this has come on without apparently any adequate cause. There has been no undue increase in exercise. There has been no known or obvious reason for "taking cold," no coryza, no preceding pharyngitis. The fever and the malaise from it are without fault of his. There is an increase in cough, usually moderate, the increase in expectoration is also slight as a rule, though occasionally marked. When so marked it will be found that the increase is almost wholly mucoid. The purulent heavy or yellow portions are as a rule not relatively or proportionately increased. There is rarely any sense of tightness in the chest suggestive of an acute bronchitis. The picture is never that, but rather of a so-called "flare up of the old lungs." On examination, however, there is this difference: often, especially in cases where there is much scar tissue, the only change in signs is that the formerly coarse, dry râles have become a little sticky. There are no fine râles; no new râles; no evidences of new infiltration or moisture along the border of the old areas. This is most suggestive, for almost invariably new activity will show itself at the edge of the previously unaffected tissue. There may be no increase in signs whatever, leading at first to the careless assumption that any new focus or activity is deep-seated. The tongue may be coated or remain clear. The bowels have usually been normal, and are sluggish only from the confinement to bed and the light diet usually imposed. There may be some sweating at night in patients so dis-

posed; otherwise I have found it very rare, save as induced by drugs. If treated as a simple tubercular fever by rest in bed, the subsidence is slow and gradual, and the patient in from one to three weeks, according to the strictness of control, is out again. Such is the picture of an attack. My first suspicion that this might not be due to tubercular activity was aroused upon a comparison of carefully kept notes of physical examination, when I found that after several such periods of fever and inactivity there was in total no change in the chest condition over that noted before the first attack. Such could not have been the case had the spells been due to advancing or renewed activity. Nor was there any falling away in weight. An explanation that they were due to repeated intercurrent illness seemed to lay too great a burden on pure ill-fortune, and the picture was too similar each time. Finally, on studying my notes I found that there was in each case a fairly regular periodicity in the attacks—the onsets being from four to six or eight weeks apart, and the intervals between varying with the severity and duration of the febrile periods—a mild attack being followed by a second a little sooner than a severe one.

This similarity to migraine first suggested the possibility that the fever was due to an eliminative process—not an inflammatory one. Acting on this theory I found that by the use of oxidizing aids, salicylates, potash and purgation, the attack was shortened. Upon following out this clue—that the periodic fever was due to an attempt to eliminate incompletely oxidized waste—an attempt was made in one case in which the attacks had been quite regularly spaced, to forestall the next attack by giving a purge and large doses of salicylates forty-eight and twenty-four hours before the expected return. This was partially successful. A second trial averted it, and subsequent to this the patient has prevented any recurrence. In one case in particular—a

physician with advancing and extensive lesion—the recognition of the non-inflammatory nature of his periodic fever put an end to his spending fully half his time in bed; and he so far regained his courage as to be married, and died three years later from acute dilatation of the heart, due to extreme fibrosis, but without a return of his fevers.

The recognition of these cases rests chiefly upon two factors: first, the repetition of attacks without adequate cause in cases otherwise under conditions for improvement, and without correspondence of evidence of tissue change to the constitutional signs; and second, upon a certain regularity of the periods of recurrence. For the first careful records of the findings at each attacks is important; for the second a record of the dates of occurrence is essential. The patient should keep a calendar, and mark each attack—a menstrual chart, as it were. A history of such repetitions is suggestive; but until a second or third is recorded exactly no certainty can be placed on the diagnosis.

In seeking an explanation of the attacks, it appeared that they occurred usually in patients with rather extensive involvement of the pulmonary tissue, such as would lead to generally lessened power of oxygenation: in patients who were especially careful in maintaining their nutrition at a maximum, and in avoiding over-exercise; who were especially conscientious in their obedience to *régime*. Many, if not most of them, were fairly liberal in their consumption of starchy foods, though rarely was any gross disproportion noted in the diet.

None of the attacks were characterized by true migraine, and none were typical bilious spells, or associated with noticeable confinement of the bowels. They apparently were pulmonic in origin. That they were due to accumulated unoxidized pyrogenous material, however, seems probable, if not proven by the prompt and often complete relief

obtained when such an origin was made the point of therapeutic attack.

That the evidences of trouble were almost wholly in the lungs seemed probably due to the fact that in the chronically congested or mildly secreting surface of the bronchial mucosa, or the ulcerated areas, there was a point of discharge along which an adjuvant elimination could take place, similar to the serous diarrhœa occasional in a nephritis. The periodicity depended on the completeness of the burning out of accumulated material and the rate of its excess storage afterwards.

Their relative infrequency in women was accounted for by the relief due to the menstrual flow; though the occurrence of fever and pulmonary congestion in tuberculous women just before the menses suggests a similar period of accumulation.

No little light was thrown on this point by the discussion in Hare's "Food Factor in Disease" on the relation of hyperpyræmia and periodicity.

If the fever resulted from such accumulation, any diminution in the intake or increased means of oxidation must afford relief or lessen recurrence. Accordingly, during an attack, unless necessitated by other reasons or marked discomfort, the patients have not been put to bed, but allowed up; have been given a scanty proteid and green vegetable diet, hyperabundance of water, and some form of salicylate, according to tolerance, and a mild calomel or podophyllin purge. In some few cases with coated tongue I have found nitrohydrochloric acid helpful. The chief reliance and the best results have come, however, from recognizing the nature and cause of the attacks, and following the indication for a greater amount of exercise in the intervals; and, when necessary in addition, anticipating each recurrence by a course of salicylates for a few days

every four, six, or eight weeks, as the case might be. Under such *régime* it has been possible to abolish some entirely; and so to lessen the severity of others as greatly to improve the physical condition and progress of the patient, and relieve him from the gloom of a supposed intractable tubercular fever.

DISCUSSION

Dr. De Lancey Rochester (Buffalo, N.Y.) said he was very much interested in this subject of recurrent febrile attacks in chronic tuberculosis, and he had had several cases which he had been unable to explain. These patients had distinct attacks of fever. In these cases other causes than tuberculosis must be excluded before assigning tuberculosis to be the cause. Among them were several cases of sinus disease, periodical in occurrence, and it was only by most careful examination that the cause of the trouble was found.

In the management of tuberculous cases, especially when they return from the sanatorium, they should be instructed carefully how to fortify themselves, how to care for themselves, and especially to pay attention to elimination through the kidneys, as well as through the skin and bowels. The alkaline diuretics were of value, and often tended to prevent the recurrence of these febrile attacks.

Dr. J. H. Pratt (Boston, Mass.) asked the reader of the paper what evidence there was that this febrile condition was due to suboxidation. He said that observations made with the respiration apparatus have shown that in the great majority of cases with elevated temperature and accelerated pulse oxidation is increased. The hypothesis of suboxidation has been advanced to explain various pathological conditions, but proof of its existence has been lacking; even in anæmia oxidation is not diminished.

Dr. Charles L. Minor (Asheville, N.C.): We have all frequently dwelt upon the sins of the general practitioner in ascribing to malaria the fever which was due, in fact, to the beginning of tuberculosis, but, on the other hand, we special workers in tuberculosis are too apt to ascribe to tuberculosis all the fever which we see in our tuberculous patients.

As to the theoretical explanation of these fevers and of the fact that has been reported I am not prepared to give an opinion. A large number of cases of recurrent febrile attacks occurring in chronic tuberculosis which have been ascribed to this disease were not due to it, but were due rather to a persistent intestinal fermentation, and will disappear on the proper clearing out of the digestive track. Some-

times one runs on cases of obstinate fever which, in spite of the most careful rest in bed, fail to yield, and in some of these I have found that by getting them out of bed and allowing them to go round the fever will disappear. There is ample room for work on the causes of febrile attacks of a non-tuberculous nature in tuberculous patients, and I trust that the time is not far distant when we shall understand the subject better.

Dr. Edward R. Baldwin (Saranac Lake, N.Y.) said that the laboratory men had an explanation for these things, but they did not claim that clinical experience could always confirm laboratory experiments. The burden of proof was really with the clinician rather than on the laboratory men. As they knew, there was a word "anaphylaxis," which was now very common in the literature. Some of their German colleagues had ascribed all fevers to anaphylaxis, and the intestinal symptoms also being due to anaphylaxis. He thought a better term would be sensitization to definite proteins.

He thought Dr. Edson's paper was a splendid one and showed careful clinical observation, but he said he would have to ask him what proof he had for these things; the mere fact that expectoration did not increase in some cases of tuberculosis with fever was not necessarily proof that there was no congestion in the focus of tuberculosis.

In nearly all fevers which could not be accounted for in simple ways, and especially those resulting from intestinal disturbances, the burden of proof of their cause rested upon the clinician; he must show that the fever was not due to some form of tuberculous congestion, but possibly to auto-intoxication, that is, intestinal anaphylaxis, or hyper-sensitiveness. An increased heart-beat and increased circulatory action from any cause favoured the lymph flow through the tuberculous foci. The laboratory explanation of the fever occurring during the active stages of tuberculosis would be a form of protein intoxication which was called tuberculin anaphylaxis. There was a great deal of experimental proof to show the unstable condition of these tuberculous patients, and fever could be excited by slight changes in the tuberculous foci. Dr. Baldwin was sure that Dr. Edson's contention was important in a clinical sense, but when it came to analyzing the cause of these intercurrent or recurrent fevers he thought the laboratory men had an explanation for it.

Dr. Lawrason Brown (Saranac Lake, N.Y.) said he had seen a number of these cases of recurrent febrile attacks in chronic tuberculosis cured by a prolonged rest in bed; when the attacks came on one after another he sometimes kept them in bed two or three months, or until the attacks ceased altogether.

Dr. Brown had recently done some work, studying the bacteriology of the blood in patients afflicted with pulmonary tuberculosis, and he found secondary organisms circulating in the blood in a number of

instances. Possibly he examined the blood of sixty-three cases, and he found the pneumococcus and streptococcus in 20 per cent. of the incipient cases, 27 per cent. of the moderately advanced cases, and 55 per cent. of the far advanced cases of pulmonary tuberculosis. He thought that anaphylaxis might be due to a dissolution of these organisms. However, this was a factor that should be taken into consideration in the studies of these peculiar attacks of fever which occurred in chronic tuberculosis with no increase in the signs.

Dr. H. McL. KINGHORN (Saranac Lake, N.Y.) said that all had observed recurrent febrile attacks in chronic tuberculosis; they occurred in the far advanced cases. The patients went along smoothly, and then there would appear these periods of fever, lasting a few days. If the patient had been running a normal temperature and an attack of fever occurred, they could safely assure the patient that he would get through this attack quickly. An important point, though, occurred in subsequent attacks. The patient should be kept at rest in bed for a period which corresponded to the length of the attack; if the attack lasted three or four days, he thought the patient should be kept in bed three or four days, and then allowed to get up and about slowly. An important point was that, whatever was the cause of this recurrent fever, the focus of the disease was easily disturbed. What was necessary was to get the patient in a stable condition. Clinically, it was noted that in the course of the disease the next attack of fever would not occur so soon as the last, and finally the patient was likely to grow out of them altogether, although on the same diet. The patient seemed to have gotten into a stable condition. The cases gradually improved, and would soon cease having these febrile attacks if you gave him time. During these attacks exercises should be withheld.

Dr. J. H. ELLIOTT (Toronto, Canada) said that these cases fell into two classes. There were some cases in which there practically was no increase in expectoration, and a careful examination of the chest would show but slight changes in the adventitious sounds. These were not the open cases, but the closed, or almost closed, cases of tuberculosis where the tubercle bacillus was infrequently found in the sputum. In those cases in which the expectoration was not increased he had found the recurrent attacks of fever lessened by the use of calomel or podophyllin, or some purgative medicines. The value of these medicines was brought to his attention years ago by a patient who had been under Dr. Kinghorn's care. This patient was improved very much. Dr. Elliott now used these remedies with considerable good effect, particularly in those cases in which expectoration was not increased. But in those cases in which the expectoration was increased a satisfactory procedure had been the use of the autogenous vaccines; by their use a great lessening in the number of attacks of fever occurred, more particularly in the closed, or almost

closed, cases of tuberculosis; in such cases the attacks were frequently overcome by this means.

Dr. William Charles White (Pittsburg) said that the underlying weakness in a study of recurrent fever of chronic tuberculosis is a lack of knowledge of what produces the fever in tuberculosis itself. For two years we have been watching carefully the temperature of certain patients; rectal temperatures were taken every fifteen minutes for twenty-four hours. The temperature rise is more or less of an explosion occurring in a comparatively short period of the day. A proteid substance can be obtained from the tubercle bacillus which, when given hypodermically, will produce fever after some hours in the tuberculous. There may be some proteolytic enzyme which appears at a certain time, possibly in the blood of the tuberculous, which splits this proteid into a fever-producing substance. We have been attempting to show this to be so by the use of a polarimeter; but we have, as yet, nothing to report. Better knowledge of the cause of the fever itself is necessary before we can enter intelligibly into a discussion of what causes these recurrent febrile attacks in chronic tuberculosis.

Dr. Gordon Wilson (of Baltimore) said that those who were experienced in children's diseases knew how often these attacks of fever occurred in children who were not tuberculous, the cause of the fever being apparently due to digestive changes. Again, it must be remembered that there occurred a post-typhoid fever which was probably due to starvation, as it disappeared on increasing the food. It seemed to him that the cause of these recurrent febrile attacks in chronic tuberculosis might be considered a form of anaphylaxis.

Dr. Carroll E. Edson (Denver, Colo.), closed the discussion. He said that when he wrote the paragraph suggesting a cause for the condition described he was not unaware of the motto of the politician, "He who explains is lost."

In reply to Dr. Rochester, he said that before deciding upon a thoracic cause for the fever one must first assure himself that there was no organic lesion elsewhere to account for these attacks of fever. An unrecognized sinus disease might account for the symptoms in some cases.

In reply to Dr. Pratt, he said that he was aware that the results of laboratory studies showed that an increase in the temperature and pulse-rate was accompanied by increased oxidation rather than by sub-oxidation. This tended to confirm his explanation of the attacks described. The period of the fever depended upon the time required to burn up the waste material accumulated during the intervals when oxidative processes were insufficient. During the attack, while the waste material was being burned, one would expect to find oxidation increased. While he had carried out no laboratory work on these cases himself, the clinical features were entirely consistent with the laboratory work referred to by Dr. Pratt.

In reply to Dr. Minor, he said that many cases of recurring fever were doubtless due to intestinal fermentation not associated with other manifestations.

He said Dr. Baldwin's objection that lack of expectoration was not necessarily evidence of absence of a tuberculous process was, of course, unanswerable. In some cases there were clinical evidences of fever without increase of expectoration, similar to cases which might be called "cold" without coryza.

With regard to Dr. Brown's remarks of proteid retention, this was, of course, a theoretic explanation, and quite as likely to be correct as that which he offered. The fever might be due to a retention of bacillary products, but also equally well might be due to alimentary or other proteids. We must remember that anaphylaxis is a most useful theory, which explained many phenomena; but we must be careful not to accept this hypothesis as a finally proven condition, lest we elevate it to the position of that other blessed word—Mesopotamia.

With regard to the use of vaccines, he did not believe they were called for in this type of case—certainly not if the cause were that suggested. In the ordinary attacks in this group the increase in the amount of the sputum was found to be moderate, and mucous rather than purulent, similar to that produced during a simple acute attack of tracheitis. Its prompt subsidence under the treatment described seemed to rule out the need for vaccines. Doubtless there were many cases of recurrent fever from secondary infections in which vaccines would be advantageous.

Dr. Edson said he would yield to no one in the importance of urging upon the patient the necessity of prolonged rest, and in bed, when there was a tuberculous fever and inflammatory activity. He had kept patients in bed seven, and even eleven months, and had met with final success in such cases. He admitted that ninety-nine cases out of a hundred were probably due to a flaring up of the tubercular process, little activities, and probably a protein anaphylactic phenomenon. But every now and then there appeared cases which, while the primary assumption was that they were of tubercular nature, had proven difficult of explanation and resistent of management along the usual lines. It was this other type, exceptional to be sure, which he had tried to describe; and the burden of proof in some of these cases might well lie with the clinician. The fever might prove due to other causes, and not to the tubercular disease itself.

With a sense of his obligation to, and respect for, laboratory men, clinical facts were, in his opinion, as good as laboratory facts—sometimes.

TREATMENT OF ARTERIOSCLEROSIS.

BY THOMAS D. COLEMAN, A.M., M.D.
AUGUSTA, GEORGIA.

It is doubtless true that in the past many cases of arteriosclerosis were classified as Bright's disease, heart disease, apoplexy, &c. It is just as true that making due allowance for these mistakes of classification or diagnosis, that arteriosclerosis is increasing in frequency with a rapidity well calculated to demand earnest and critical study. It is not difficult to account for the causes of this increasing frequency; but it is a greater problem to suggest remedies which will prove efficient to check it.

Syphilis, tuberculosis, the acute infections, auto-intoxications, mineral poisons, excessive physical and muscular strain have all been proven to be causes of arteriosclerosis.

Many of the causes operative in the production of arteriosclerosis are insidious in onset, and the disease is well advanced before medical aid is sought.

These facts are readily explainable, but they make the treatment of the disease a much more difficult problem; for the only hope of cure of cases of arteriosclerosis lies in our ability to make an early diagnosis, and our rational treatment of the underlying cause or causes. After the sclerosis is well advanced a return to the normal is not to be expected, and the treatment is for the most part symptomatic and general.

In sclerosis produced by syphilis, antisyphilitic treat-

ment should be begun early. When this is instituted and properly carried out, a very large percentage of cases of arteriosclerosis will be prevented; and those of us who reside in the cities (for syphilis is largely an urban disease) recognize what this means to the race.

Just what amount of good salvarsan will effect in syphilitic sclerosis, even when moderately advanced, remains to be seen. We should watch more closely and more continuously over our cases of acute infection. That this does not pertain to the extent that it should is attributable to two causes: an unwillingness in the patient to undergo what he considers unnecessary medical treatment, and to the physician's feeling that the patient is well as soon as the acute infection is passed.

These will perhaps adjust themselves as time goes on.

The abuse of alcohol, tea, coffee; the strenuous life, leading as it does to physical and nervous excesses; over-indulgence in food, insufficient food, meals taken irregularly and without thought or zest, meals poor in quality and improperly prepared; all lead to gastro-intestinal disturbances which are recognized as producers of the disease.

The avoidance or correction of these indiscretions of living hold out the only hope of either prevention or cure, and are but additional arguments for more regular medical supervision of the average business or professional man or woman.

In cases produced by mineral poisons much havoc has usually been produced before the aid of the physician is sought, but in these also the earlier the ætiological factor is recognized and eliminated the more promising the final issue.

After the disease is well established more or less constant medical oversight is essential, not only for the prolongation of life, but for the procuring of bodily comfort as far as

may be while life lasts. When syphilis, the acute infections, and mineral poisons can be excluded, and hence specific treatment is not indicated, much can be accomplished by running the machine at low pressure. Many defective water mains in a large city may be made to serve for years, if too much pressure is not put through them from the pumping station, and similarly many arteries will function fairly well if not subjected to undue strain.

The alternative may safely be presented the average sensible patient: Are you willing to live for years at diminished pressure, or do you prefer to take the chances of bodily discomfort and possible instant death by running at high speed? To this end regularity of living must be enjoined; business and domestic cares which wear the mind and waste the body must be curtailed; in some cases, when possible, abated.

It is probably true that in all cases where excessive blood-pressure exists it is wise to curtail the use of condiments, *i.e.*, tobacco, coffee, tea, alcohol, &c.; but the writer is of the opinion that when these have been used constantly, throughout the life of the patient, they might be withdrawn so suddenly as to produce harm instead of benefit. That is, the organism that has been regularly under more or less constant stimulation may not be able to withstand its abrupt and total withdrawal.

This phase of the subject furnishes enough material for a paper in itself. Often a horse can finish a race to its winning under whip and spur, when he certainly would lose without these stimulants; sometimes these prove disastrous, and the wise rider will study his mount.

Certain it is that where the intravascular pressure is excessive it must, if possible, be brought within reasonable bounds.

In the absence of specific poisons in the blood it may be

diminished by removing or diminishing business and domestic cares, and regulating the amount of physical exertion that the patient may take; the first usually includes the last, but not always. Exercise when properly directed is of distinct benefit, but the instant it throws too much tax on the heart it should be abated, and there are cases in which absolute physical and mental rest, as far as may be obtained, should be enjoined. In these latter cases, where active exercise for one reason or another cannot be taken, much good will accrue from massage wisely applied. Baths are of distinct benefit. Among those most generally applicable are the hot plunge-bath, in which the body is immersed at a temperature of 100° to 105° F. for five to seven minutes, afterwards followed by an alcohol rub down and rest for an hour or more; hot air or electric baths, the object being to get the patient into a sweat, these to be followed by the alcohol rub and rest period; and the carbonic acid or so-called Nauheim bath—all should be directed by a medical adviser and under the direct supervision of an experienced nurse.

The diet should also be under constant expert supervision and a hard and fast dietary for all cases cannot be laid down. Generally speaking, meat should be indulged in sparingly and in some cases prohibited. Carbohydrates, especially in the form of rich desserts, are apt to lead to gastro-intestinal fermentation, and all food fried in lard or oil are admittedly hard to digest.

The average case will at some time require purgatives or cathartics, and some cases require them constantly.

When the tongue is coated and nausea with aversion to food exists, nothing in my experience takes the place of calomel, either in a single dose at bed-time or in broken doses.

Podophyllin in some cases is efficient. The saline

cathartics, and the various mineral waters, among which may be mentioned Hunyadi Janos, Rubinat Condal, Friedrichshall, Pluto, the waters of Carlsbad, all have their uses and are of value in appropriate cases. In a medical way, aside from the specific cases mentioned, the treatment is almost entirely symptomatic.

The iodides of potassium, and sodium in small doses may be continued throughout many months without unpleasant effect, and have, in my practice, apparently produced beneficial effects in a large percentage of cases.

Where the tension is high no drug apparently takes the place of nitro-glycerine. It does not derange the digestion, it dilates the peripheral vessels, thereby diminishing tension and reducing the work of the heart, and may be given for long periods without any harmful results.

DISCUSSION.

Dr. James M. Anders (Philadelphia, Pa.) said that this was a very important and interesting subject, particularly from the standpoint of treatment. He agreed with Dr. Coleman that the instrumental measurement of the blood-pressure was, after all, less valuable in some cases at least than careful palpation. Palpation enabled one to estimate the degree of tension, and at one and the same time to distinguish between arteriosclerosis and mere high tension, and this was a very important matter from the standpoint of treatment. The successful treatment of arteriosclerosis was the treatment of the cause or causes. In individual cases, therefore, the causes should be carefully searched for; and when found an attempt should be made to remove them. The earlier the cases are met with, the more successful would be their efforts at treatment. Since the introduction of the Wassermann test (many cases of arteriosclerosis being found to be due to syphilis) one was enabled to recognize the specific cause of many cases that often previously had been in doubt. Now these cases on that account were more successfully treated, for unless the cases of arteriosclerosis were much advanced it was safe to give salvarsan. Of course, if there were associated cardiac, or renal or

other lesions, one should not give this agent without due care and consideration.

There are many causes of arteriosclerosis, and he was sure that one of them was the strenuous life of to-day. In his own city, Philadelphia, the men in many cases, as pointed out by Friedman, look neither to the right nor left, but, with heads down and hands clenched, appeared to be bucking the football line. These were the cases they were able to help. In many of them the rest treatment, together with the use of vaso-dilators, was highly successful. At the same time they should be given a generous diet to replenish their exhausted store of nervous energy.

There was another class, the toxin cases, in which the eliminative treatment could accomplish much good, when these patients were also properly fed and adopted a proper mode of life. In these cases they should restrict the proteids and order suitable forms of exercise.

With regard to the medicinal treatment, he believed that the use of sodium iodide would benefit these patients if continued over a sufficient period of time; it did seem to soften the vascular walls. It also reduced the viscosity of the blood without diluting it. If, however, this agent disagreed with the stomach, they were in danger of losing more than they gained by its use. In those cases due to syphilis, the iodides should be given with a free hand.

The use of sodium nitrate had been disappointing in his experience, and this was largely due to the fact that it was extremely difficult to obtain a good and reliable preparation. Parke, Davis and Co. probably made the best preparation of sodium nitrate, a fact that he thought worth while mentioning. The benefits from the use of sodium nitrate were more lasting by far than those obtained from that of nitro-glycerine.

Dr. A. Jacobi (New York) said that the only preventive against arteriosclerosis was to die in time. Neither his audience nor he would escape arteriosclerosis after they reached middle age. They had known for decades, after the researches of Plummer, that arteriosclerosis began about the thirty-fifth year of life. At and after that age it appears in almost everybody, and if they did not feel or realize it, it was because arteriosclerosis was less equally disseminated and more localized in certain spots. If arteriosclerosis was first noticed in the kidneys, then there was a kidney disorder possibly amounting to a nephritis; if in the brain somewhere, they had apoplexy; if in the lower extremities, they would have intermittent claudication; the localization of the arteriosclerosis would determine the symptoms, the outlook, and the final determination. They were all to die either in consequence of or with arteriosclerosis.

So far as the treatment was concerned, they had been told that large meals must be avoided; when advised not to take large meals they were also advised to eat slowly. Few Americans knew how to

eat; they ate too fast, and particularly doctors. Eat slowly; do not drink much; when wishing to take a good drink, remember that sipping the water increased the amount circulating in the blood-vessels from 5 per cent. to 8 per cent. in a few minutes, and that should be avoided. Dr. Jacobi told his patients to take a glass of water and divide it into six parts, and to take one part every ten minutes. In this way the stomach was not filled. Those patients who were well-to-do could afford to be slow about their meals and drinking, but the vast majority of the people could not, or would not, obey such orders. This same thing applied to the poorer and middle classes of people who suffered from tuberculosis. These patients should be watched with care.

With regard to the use of iodine, Dr. Jacobi had taken iodine for six months in succession, and then broke off from it because he did not think he required it further. He could not take iodide of potassium, nor had he seen many patients who could long take it. The more digestible the iodine the better, and he used sajodin, which was a good preparation; after a single dose or two iodine could be found in the urine.

So far as the treatment of arteriosclerosis was concerned, there had been a great number of preparations in use. He had seen on the market a preparation appearing under the name of "Antisclerosin," which was first recommended in France. This preparation had done good, and was composed of a number of salts of sodium in small quantities, the sulphates, the phosphates, the carbonates, and some magnesium. He could not give the exact formula; the total sum of these alkaline salts was not more than 14 gr. or 15 gr. a day, which were taken in about three doses. The value of this remedy he learned from a patient of his, who had taken it for months first, and then for years. Dr. Jacobi had given small doses of the alkalies in that way since, but not using the tablets that were on the market. He believed this preparation did good; it certainly relieved the patient of his symptoms. He had seen men of 70 or 75 years of age with intense symptoms of arteriosclerosis living a quiet and comfortable life and attending to their business while taking this preparation.

With regard to the bad attacks of arteriosclerosis, particularly those caused by deposits in the coronary arteries causing angina pectoris with very severe pains, he asked, what could they do with them? He advised doses of nitrites with morphine. In sudden severe attacks give big doses of morphine hypodermically. However, one could not carry coals to Newcastle in this society. He gave morphine, ¼ or more of a grain of morphine and from 1-100 to 1-150 of atropine, having the patient place it on his tongue and suck it down and not swallow it at once. It had practically the same effect as if it was given hypodermically. Most of these people were old people; if they

got the morphine habit, they were welcome to it. If a man of 75 years got the morphine habit, Dr. Jacobi could see no harm in it. He feared morphine less than he did angina pectoris. He used morphine in these cases a great deal. He gave the patient one dozen such tablets to put in the pocket; when an attack came on the patient placed one on his tongue, sucked it down, and was relieved.

Dr. CHARLES L. MINOR (Asheville, N.C.): As to the drug treatment of these cases, iodide of potassium in doses not greater than three to five grains, very often as small as two, I have found to be of real value, and would be very sorry to be deprived of it; but to my mind of far greater value is the combination of strict dietetic and a psychic treatment.

We Americans are more apt to worry our arteries into hardening by the result of hurriedly eaten and badly digested food, all on account of our foolishly intense American life. If we could follow the English way of living, I think we should find much less arteriosclerosis. In these modern days, I think it is the doctor's duty to warn such of his patients as are living in this fast way of the possible danger of this disease, and show them how they can live so as still to enjoy life, and yet to largely decrease the danger of the trouble. Of course, sometimes the advice will not be followed, but at least we shall have done our duty. In such people I am satisfied that two meals are much wiser and safer and better than three, while all highly seasoned or spiced foods should be avoided. By sensible dieting, by the avoidance of alcohol, by eating less than they want, a great deal can be accomplished. Unfortunately, the American temperament, which is at bottom the cause of all this trouble, cannot be changed, but at least something can be done.

Dr. THOMAS DARLINGTON (New York) reported several members of one family who lived to old age, and had not died directly because of arteriosclerosis; there were 100, 101, and 103 respectively; four others were over 90, and five others were still alive at 86. Dr. Darlington was interested in this question of longevity, and he inquired of various members of the family how they lived to such an age, and all gave the same experience, *viz.*, the following of Dr. Jacobi's advice: Do not bolt food; eat sparingly; keep bowels open (one member said this was the principal thing); in other words, have clean hands; have clean hearts, and then you would be all right and live long.

Dr. EDWARD R. BALDWIN (Saranac Lake, N.Y.) said that in health resorts and institutions for tuberculous patients the inmates were prone to over-eat, and his experience suggested to him that this might be a very important factor in the production of arteriosclerosis.

Dr. GUY HINSDALE (Hot Springs, Va.) said that anyone who practised in health resorts saw many of these cases of arteriosclerosis. He had seen a large number who came to these resorts for hydrotherapy.

Dr. Swan had told him of his observations on the effects of the CO_2 baths on arterial blood-pressure; he said they did not affect the blood-pressure either one way or another. After practising at Glenn Springs, N.Y., for a number of years, he stated that it was impossible for him to say that in the advanced cases of arteriosclerosis which presented themselves for treatment by the CO_2 baths there would be, after an interval of rest, a lowered or a raised blood-pressure. The whole relationship between these baths and the blood-pressure seemed to be very uncertain. He thought it would be desirable if we could arrive at some definite conclusion, could have some definite information regarding the effects of these CO_2 baths on the arterial blood-pressure. Many now were at variance on this subject.

Dr. J. H. PRATT (Boston, Mass.) said that he had made many observations on the action of carbon-dioxide baths, and he was sure that a course of these baths had no permanent effect on the blood-pressure. He has seen a few cases in which, during the time the patients were following this treatment, some reduction in the blood-pressure occurred, but this reduction he did not believe to be due directly to the baths. On the other hand, the immediate action of these baths on the blood-pressure was striking. If the patient had a normal heart, and a full strength bath was given at a temperature of 93° F., a rise in the blood-pressure would occur; on the other hand, he found that if the heart was weak, the full strength bath would be followed by a fall in blood-pressure. It had been shown that the temperature of the water had a marked effect upon the blood-pressure, as much so, in fact, as the CO_2 gas.

THE MORE COMMON FORMS OF CARDIAC IRREGULARITY WITH THE REPORT OF A CASE OF HEART-BLOCK.

By THOMAS A. CLAYTOR, M.D.

WASHINGTON, D.C.

This subject has been taken up because I believe that it has been too much neglected by the rank and file of internists. I think that one might say without fear of contradiction that without some previous knowledge gained by the instrumental study of the pulse, either with the polygraph or the electrocardiagraph, that there are but few who are able to interpret, with any degree of accuracy, the various forms of irregular pulse, and are, therefore, unable to give them their proper value as to prognosis and treatment.

That such knowledge may be at times of great importance I hope to show in the following pages.

In the last sixteen years epoch-making discoveries have materially advanced our knowledge of the histological anatomy of the heart and of its rhythmic action. In fact, A. R. Cushny [1] said that although the study of the pulse had extended as far back as medical history, more progress had been made, in certain directions, in the past fifteen years than in the previous century. As pioneers in the work upon cardiac arhythmia, the names of Mackenzie, Wenckebach and Hering probably stand out most prominently.

Putting aside any discussion as to the relative merits of the neurogenic or the myogenic origin of the heart-beat, it is found most convenient to study cardiac arhythmia, keeping always before us the qualities which have been assigned to the heart muscle, which are :—

(1) Stimulus production—the power to produce a stimulus which will excite the heart to contract.

(2) Excitability—the power to receive a stimulus.

(3) Conductivity—the power to convey a stimulus from one part of the heart to another.

(4) Contractility—the power to contract on being stimulated.

(5) Tonicity—the power to remain in a certain degree of contraction even when the active stimulation has ceased.

Under normal conditions the cardiac contraction begins in the specialized tissue at the junction of the descending cava and the right auricle, spreading thence to the rest of the heart. This, the sinu-auricular node (Keith and Flack) [2], is then the pacemaker of the heart and the rhythmic contraction having its origin here is called the fundamental rhythm. In the wall of the right auricle, near the coronary sinus, is another specialized area, the auriculo-ventricular node (Tawara) [3], and it is from this point that arises the auriculo-ventricular bundle of Kent [4] and His, jun. [5], which forms the connecting link for impulses between the auricles and ventricles dividing into two limbs, the one passing to the right and the other to the left ventricle.

While there are instances of cardiac irregularity which are difficult to classify, the majority fall under the following heads: (1) Sinus or youthful arhythmia; (2) premature contraction or extra systole; (3) heart-block (partial or complete); (4) the wholly irregular pulse (auricular fibrillation), with perhaps the addition of (5), the pulsus alternans,

though the last named is an irregularity as to volume rather than as to time.

Some authors assign each of these forms of irregularity to a disorder of some one of the special qualities of the cardiac muscle. Thus sinus arhythmia is said to be due to disturbance of the sinu-auricular node in its impulse producing quality, the extrasystole to disturbance of excitability of the muscle; heart-block to disturbance of conductivity; auricular fibrillation to disturbance of contractility. If this be true the whole study of cardiac arhythmia is greatly simplified, but it has not yet been proven.

I shall now briefly consider the most striking characteristics of the above-named forms of arhythmia as they are

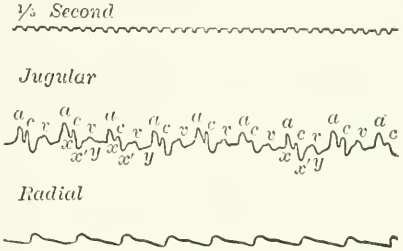

FIG. 1.—Polygraphic tracing of the normal pulse.

portrayed in polygraphic tracings, together with their ætiology, pathology, diagnostic and prognostic value.

As the appreciation of the abnormal polygraphic tracing is absolutely dependent upon an understanding of the normal, we may with profit refresh our memories by a brief consideration of fig. 1. It may be seen that in the venous tracing there are three distinct upward (positive) waves (*a*, *c*, and *v*) and as many downward (negative) waves (*x*, x^1 and *y*). The *a* wave in the venous tracing is produced by the state of increased pressure in the jugular vein, resulting from the contraction of the right auricle; the *c* wave,

while it is not wholly due to the carotid pulsation, for all clinical purposes may be considered to make its appearance synchronously with the beat of that vessel at the same level of the neck. The time between *a* and *c* is known as the *a-c* interval, and is of great importance as it determines the state of conductivity between the auricles and ventricles. The *v* wave, often called the ventricular wave, makes its appearance during ventricular systole, reaching its highest point just before the auriculo-ventricular valves open. The negative waves *x* and x^1 (usually considered as one) are probably the result of three factors: The relaxation of the auricular walls in early diastole; the state of negative intrathoracic pressure consequent upon the ventricular systole; and the dragging down of the auriculo-ventricular septum during ventricular contraction. The *y* wave occurs as the result of a state of negative pressure in the ventricles during their diastole, at the same time the auriculo-ventricular valves open and allow the blood to pass into the ventricles.

The arterial tracing (usually the radial) is necessary for the identification of the important elements of the venous curve. Thus the *c* wave may be determined by the fact that it appears 1/10 second before the radial impulse, the *a* wave because it appears 1/5 second before the *c* wave, and the *v* wave by the fact that its apex occupies the same relative position in the venous tracing as does the dicrotic notch in the radial. As pointed out by Lewis [6], the proper identification of the *v* wave may be of considerable importance in the correct reading of a tracing in which heart-block is suspected.

Sinus or Youthful Arhythmia may best be described as a difference in the time rate of the cardiac contractions with but little difference, if any, in their force. When venous and arterial tracings are taken simultaneously it will be noted that they are perfectly synchronous in their

corresponding details. The arterial tracing will show the systolic peaks to be of about the same height but at varying distances from each other. The irregularity is best seen in a slow pulse, since rapidity, by reducing the diastolic pause, has a tendency to lessen the abnormality. A similar form of arhythmia may be produced in normal individuals by causing them to take some forced inspirations. The pulse will be found to become more rapid during inspiration and slower during expiration. The cause of sinus irregularity

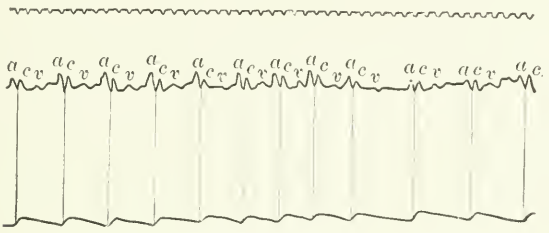

FIG. 2.—Sinus or youthful arhythmia.

is reflex coming through the vagi and does not have its origin in the heart itself. It is observed in young and nervous individuals, also during convalescence from illnesses such as epidemic influenza, &c. It may or may not be noted by the patient, often it is not, though occasionally the diastolic pause is so prolonged as to produce cerebral anæmia with syncope. The prognosis is good in all cases. It may be relieved by atropia.

EXTRASYSTOLE.

According to Mackenzie [7] the term "extrasystole" should be limited to those premature contractions of auricle or ventricle in response to a stimulus from some abnormal point of the heart, but where otherwise the fundamental or sinus rhythm of the heart is maintained.

Clinically there are recognized three varieties of extrasystole: The auricular, the ventricular, and the auriculoventricular, depending upon the point from which the abnormal stimulus takes its origin. Before going further, it may be well to call attention to some physiological facts. It has been shown that if the ventricle be stimulated at any time during diastole (the receptive period of the cycle), that it will respond by contracting, but that the force of the contraction is entirely independent of the strength of the stimulation. In other words, the ventricle responds with its entire strength to any stimulus which is sufficient to cause a contraction; the "all or nothing" phenomenon of Bowditch. During systole the ventricle is in the so-called refractory period of the cycle, when it will fail to respond to any stimulation. The strength of the ventricular contraction depends on the amount of energy which there has been time to accumulate. If then the stimulation has been premature the contraction will be feeble, if delayed, correspondingly strong.

In fig. 3 we have an example of ventricular extrasystole. In the radial tracing at r^1 may be seen the evidence of a premature and weak pulse-beat. In the venous tracing the peak marked c^1 represents the premature ventricular contraction. It corresponds in general outline fairly well with the *c* peaks, but is earlier in the cycle and is quite a little higher; in this instance the ventricular contraction has occurred at the same time as the auricular, thereby throwing the *a* wave and the *c* wave together, which accounts for its unusual height. This auricular contraction is not followed by the usual ventricular contraction because the ventricle was in systole (the refractory stage) at the time the auricular impulse reached it. This accounts for the longer pause after r^1, which is known as the compensatory pause. If a measurement be made it will be found that the

space between the radial pulsation immediately preceding r^1, plus that immediately following it, is the same as the distance occupied by two whole cycles of the regular beating ventricles. In other words $a = b$. It may also be determined by measurement that the auricular rhythm is not disturbed, *i.e.*, the *a* waves occur at practically regular intervals from each other in spite of the disturbed ventricular rhythm as shown by the extrasystole. In some instances the *c* wave actually precedes the *a* wave in the venous tracing. Occasionally in a slowly beating heart the ventricle has had time to recover sufficiently after an extrasystole to respond to the auricular impulse, as it would if there had

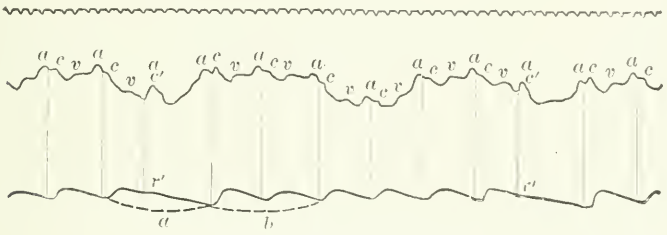

FIG. 3.—Ventricular extrasystole.

been no extra ventricular beat, and we have then an interpolated ventricular contraction. The impulse for a ventricular extrasystole has its origin in that portion of the bundle of His beyond the node of Tawara, or in its ramifications in the ventricle.

Fig. 4 is an example of an auricular extrasystole. The radial tracing shows the abortive ventricular beat, the venous tracing presents an unusually early *a* wave, which is followed by the premature *c* wave. At times the *a* wave may come so early as to coincide with the *v* wave of the preceding cycle, at which times it is often unusually high. The impulse for the auricular extrasystole has its origin in

some other portion of the specialized auricular tissue than the sinus.

The auriculo-ventricular extrasystole takes its origin from the node of Tawara. In this form the auricle and ventricle contract simultaneously. It is a more difficult form to identify from the polygraphic tracings than the other two.

So far the exact value, from a clinical point of view, of the differentiation of the three varieties of extrasystole, has not been definitely determined, but it seems very likely that with a more complete understanding of the subject this will be developed.

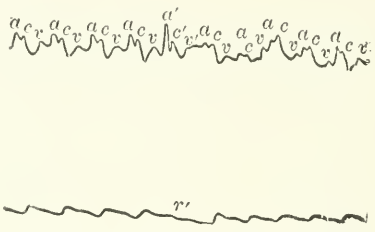

Fig. 4.—Auricular extrasystole.

The Pathology of Extrasystole.—Extrasystole evidently occurs because of an increased irritability of the specialized cardiac tissue (primitive tube of Mackenzie) so that impulses are received from other points than the sinu-auricular node. The pathologic lesions, when present, are of the sclerotic type, hence the condition is most often seen in those who suffer from arteriosclerosis or where there are fibroid changes in the heart from other causes such as rheumatism. It may be seen at any age, though it is, of course, more common in those past middle life. There seems to be a growing tendency to consider extrasystole an evidence of serious change in the heart muscle, in spite of the fact that experience has taught us that in many in-

stances it may be present for long periods without other signs of heart disability. Gastro-intestinal disturbances are not infrequently the cause of extrasystole, as is also the excessive use of tobacco.

There may or may not be subjective symptoms of this disorder. Some patients are entirely oblivious to the abnormality, while others are greatly annoyed by a fluttering sensation in the region of the heart, or they complain of the violent throb which follows the long pause; some have a sensation of great weakness when the heart is intermitting. Some, in fact, become so disturbed and nervous that they are almost typical neurasthenics. Medication directed toward the correction of this disorder is very unsatisfactory.

Heart-block (Partial or Complete).—This form of irregularity is much less common than those just described, and is due to a disturbance of conductivity. The impulse which starts at the sinu-auricular node may be delayed or entirely obstructed in its progress to the rest of the heart, resulting in partial or complete heart-block. The interruption may take place at the sinu-auricular or at the auriculo-ventricular junction, and, according to some, at the inter-ventricular junction (dissociation of the ventricles). The most usual and most important of these is the auriculo-ventricular heart-block, which may be either functional or organic. Functional block, as a rule, results from excessive doses of drugs of the digitalis group. This accident, however, is much more likely to happen in cases where the bundle of His is diseased. Organic block is due to disease of the bundle of His or the tissue immediately surrounding it. The common causes then are sclerotic changes in the coronaries with the usual results or old rheumatic inflammation. Rarely, however, the bundle of His may itself be the seat of a growth such as gumma, or

may be pressed upon by such a tumour. The first indication of heart-block is a lengthening of the *a-c* interval (the time between the appearance of the *a* wave and the *c* wave in the venous tracing). In other words, the ventricular contraction does not follow the auricular as soon as it should. This lengthening of the *a-c* interval may be for a long time the only evidence of interference in conduction, then the impulse may from time to time fail to get through, resulting in the dropping of a ventricular beat. This may occur at regular or at irregular intervals, and if the block becomes complete the ventricle assumes its own rhythm, which is much slower than that of the auricle. It is in these cases that the Stokes-Adams syndrome is observed.

In organic heart-block the prognosis is necessarily grave, though there are cases on record which have lived for a number of years after the development of the condition. Of course, the cardiac capacity is reduced in proportion to the degree of block. The functional cases usually recover promptly on the removal of the cause. In those rare instances where the symptom results from the effects of a gumma upon the bundle of His, antiluetic treatment may be resorted to with some hope of success. It is easy to see that the use of digitalis in cases of heart-block might be fraught with great danger because of its tendency to delay transmission of the impulse from the auricles to the ventricules. James Mackenzie [8], however, makes the following statement: "The presence of heart-block is not necessarily a contra-indication to the use of digitalis. When it is complete it cannot interfere with the conduction of the *a-v* bundle, for conduction is abolished, and so far there is no evidence that digitalis has any effect on the ideoventricular rate." Drugs of this group would certainly appear to be contra-indicated where there is a tendency to heart-block, and, if used at all, it should be with the greatest caution.

Fig. 5 is from a case of heart-block of the 2-1 type, the history of which is briefly as follows:—

H. B., white male, aged 47, married, a manufacturer. His parents had been long-lived and his own health, when a young man, had been excellent. At 27 he became infected with lues, which was not treated for six months. He then became quite ill and the real condition was recognized and he received proper medication for a few months continuously, and for years, off and on, for the disease con-

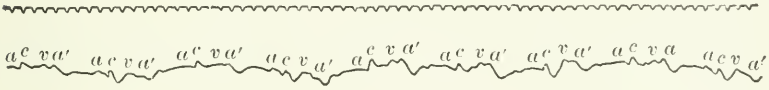

Fig. 5.—Polygraphic tracing from a case of 2-1 heart-block. Radial pulse about 37 to the minute.

(Note.—This tracing does not present the radial tracing clearly enough to allow of the identification of the *v* wave by the position of the dicrotic notch, but other parts of the same tracing showed clearly that the *a'* wave was no part of the *v* wave.)

tinued to manifest itself from time to time. At 35 he had typhoid fever severely. He then enjoyed good health until he was 41, when he had several fainting attacks. There was no special discomfort, simply temporary loss of consciousness. At this time a heart murmur was discovered, but there were no symptoms of cardiac insufficiency, unless the attacks of syncope were to be attributed to this cause. At 45 he had an attack of either la grippe or rheumatism (it was difficult from his description to say which), but during the illness heart symptoms developed, and three months later swelling of the feet and dyspnœa. During this attack he had peculiar fainting spells. There would be what he described as a rushing sensation from the heart

to the head and then unconsciousness lasting from one to five seconds. There was usually time for him to reach the bed or a chair before he would faint, but not always. The heart seemed to stop at the time of the seizure. At times vomiting of blood with great weakness followed. On examination the heart was found to be slightly enlarged, a systolic murmur was heard all over the præcordia with maximum intensity at the apex and transmitted to the axilla. There was also a diastolic murmur heard all over the præcordia, the second aortic was faint and the second pulmonary accentuated. The diastolic murmur was not a typical aortic insufficiency murmur nor did the radial tracing conform to the type of that lesion.

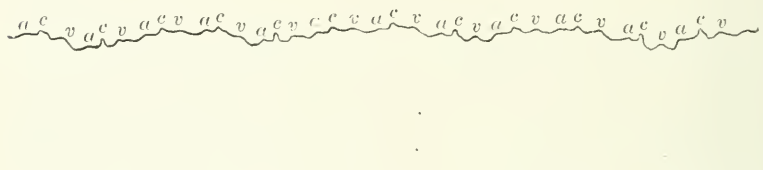

FIG. 6.—Tracing from the same case as No. 5, showing a pulse rate of about 60 to the minute and no block, but in some places a delayed *a-c* interval.

Unfortunately, I was only able to observe this interesting case for a few days as he was a transient. A Wassermann reaction was negative, and as there is some doubt as to the advisability of the use of salvarsan in those suffering from severe heart lesions, I hesitated to administer that preparation, but I advised a course of mercurial injections and my patient went to his home with the avowed intention of returning for treatment, but as yet I have heard nothing from him.

The attacks which had preceded the one in which I saw this man had been of brief duration, the heart maintaining

the slow beat but a few hours or a day at most. This attack, however, kept up for several days, with only short intermissions. He had discovered that a strong drink of whisky would, for a time at least, bring the pulse up to normal. I saw this verified. See fig. 6. During the period of slow ventricular action the patient was able to walk only at a very slow pace, and had to be very careful not to over-exert himself in any way, yet he travelled about alone, attending to his business affairs.

Auricular Fibrillation (the Wholly Irregular Pulse) is characterized by an entire loss of the sinus or fundamental rhythm; the beats are irregular, both as to

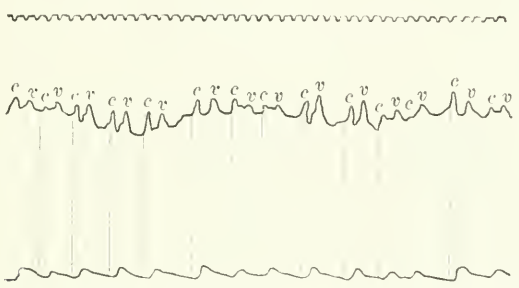

Fig. 7.—Polygraphic tracing from a case of auricular fibrillation.

time and as to volume. In the venous tracing the auricular wave is missing; in other words, there is no auricular contraction, the venous pulse being of the ventricular or positive type. Fig. 7. There is a general fibrillary contraction of the auricular muscle, but no contraction of the muscle in mass. The electrocardiagram shows an absence of the *p* wave (auricular contraction) and by a series of fine undulations that there are a number of impulses at the rate of four to nine hundred a minute trying to get through to the ventricle. Of course, the ventricle is entirely unable to respond to anything like this number and hence responds

only as it may, which results in absolute irregularity. Where a mitral presystolic murmur has been present it disappears as might be expected, it being produced during the contraction of the auricle.

Pathology of Auricular Fibrillation.—The heart muscle as a whole shows a more or less marked grade of inflammatory change resulting in fibrosis. The morbid changes are said to be particularly marked in the auricular tissue, especially at the sinu-auricular junction; the same changes have been noted at the auriculo-ventricular bundle and in scattered areas of the ventricular musculature. Though these very decided changes have been noted in cases of auricular fibrillation, just the same conditions have been found where during life the rhythm had been normal.

It is in this form of irregularity that digitalis has been found of the greatest value. It apparently acts by cutting down the number of contraction impulses which get through to the ventricle. The prognosis should be guarded in these cases.

The Pulsus Alternans is not properly a disorder in the cardiac rhythm, as the time between the beats is the same in uncomplicated cases, but it is not unusual to note the condition in combination with other forms or irregularity such as extrasystole.

This form of irregular pulse is seen clinically under two sets of circumstances, namely: (1) When the apparently healthy muscle is overtaxed, especially when the rate is unusually rapid, as in tachicardia. (2) When the musculature is profoundly affected, usually by the senile changes. It is said that in those of the second class it is frequently accompanied by grave symptoms such as pain of an anginal nature, and those who show alternation are not likely to live more than a few years. As a rule the blood-pressure is high.

In conclusion I would say that the graphic study of the pulse is not only very interesting to anyone who will give it sufficient attention, but, in many instances, facts of importance may be learned from it. It would be extremely difficult to positively identify some sinus arhythmias in any other way than instrumentally, and yet it might be of vital importance. There are also cases of extrasystole which could not be distinguished from auricular fibrillation by the usual methods of physical examination. A delay in the *a-c* interval may be the first indication of an impending heart-block, and when a block is actually established, none but the experienced observer would be able to identify it without instrumental assistance. As our knowledge of the causes of the individual irregularities become more exact, it seems fair to suppose that it will become increasingly important to be able to recognize and give them their true valuation.

While no specific reference has been made in the text of this article to Thomas Lewis's book, "Mechanism of the Heart Beat," it is a most complete collection of the data bearing upon the whole subject as well as embodying many original observations, and is of inestimable value to those who may be interested.

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[2] A. Keith and M. W. Flack. *Journ. of Anat. and Physiol.*, xli, 1907, p. 172.

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[6] Thomas Lewis. "Criticism of Congenital Heart-block," *Brit. Med. Journ.*, 1911, i, p. 593.

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DISCUSSION.

Dr. J. H. Pratt (Boston, Mass.): These tracings of Dr. Claytor interest me very much. I should like to know what apparatus he uses. I have had some experience with the Jacquet instrument, but more with the ink-writing polygraph devised by Mackenzie. I had less difficulty in making satisfactory records with the latter. This was probably largely due to the fact that I learned from Dr. Mackenzie himself how to use his polygraph.

During the summer semester of 1908 I made tracings of all the arhythmias that came under observation in Krehl's Heidelberg clinic. I sent the tracings to London, and Dr. Mackenzie kindly corrected my errors and gave me the benefit of his interpretation. So while the cases were yet in the wards we had Mackenzie's views on the diagnosis, and sometimes on the prognosis, based on the graphic records, and Krehl's opinions derived from the use of the older methods of examination. Dr. Pratt said it was sometimes difficult to decide by merely feeling the pulse whether you are dealing with a cardiac irregularity due to extrasystoles or to auricular fibrillation, but that in the great majority of cases a sphymographic record of the radial pulse, without a tracing of the venous pulse, will enable one to distinguish between the arhythmia due to extrasystoles and the absolutely irregular pulse of auricular fibrillation .

Dr. Claytor closed the discussion. He said that a Dressler apparatus had been ordered in New York, and had proven very satisfactory. He believed that the instrumental study of the pulse should be taught in all the medical schools; it was already in many. When some previous instrumental knowledge was acquired with the polygraph or the electrocardiograph, the various pulse irregularities could be much more positively identified than if one had not had such advantages.

CONCERNING SUBACUTE INFECTIVE ENDOCARDITIS.

By GLENTWORTH R. BUTLER, M.D.

BROOKLYN, NEW YORK.

For a number of years certain cases of endocarditis have attracted attention because of their latency and long duration. About 250 such cases have been studied by Osler, Libman, Horder, Billings, and others, so that we are now in a position to define it as a distinct variety, perhaps an entity, among the endocarditides.

The bacteriology of the disease is of interest. In the great majority of instances there is a bacteræmia. By far the most common organism found is a streptococcus, which grows poorly and produces a green pigment in the process. It has therefore been called the *S. mitior* or *viridans*. Its slow growth doubtless accounts for its non-discovery in a certain proportion of blood-cultures. Libman states that five or six, instead of the customary three or four, days of incubation may be needed for its demonstration. Other organisms, seldom found, are the staphylococcus, the pneumococcus, and the bacillus of influenza.

The pathological anatomy is that of a vegetative, rather than an ulcerative, endocarditis. Commonly there are found large greyish vegetations, of firm consistence. They project from the valves, and in a large number of cases involve also the walls of the left auricle and ventricle.

The long duration of this form of endocarditis is one of

its striking features. It was the chronicity of the disease which first attracted to it the attention of clinicians. It has a course of from four to twelve months, and even longer. Taking into consideration its cause and its course, it is well named subacute or chronic, infective or septic, endocarditis.

From a clinical point of view its latency is remarkable. It may be weeks or months before any sign or symptom of an endocardial inflammation manifests itself, the only conspicuous deviation from the normal consisting in a daily rise of temperature. Almost invariably the onset is slow and insidious. The fever is of a distinctly septic type, low in the morning, and reaching 100° to 103° F. in the evening. Chills are not common, but may occur from time to time. Late in the disease there may be higher temperatures, and frequent sweats.

Commonly there is not a leucocytosis, but after the disease has continued for some weeks a progressive anæmia becomes a noteworthy accompaniment. There is a clear, waxy-white, seldom yellowish, pallor of the skin, which is somewhat characteristic. So also is the preservation of the weight. Unless there is some special digestive disorder, food is taken in fair quantities, and for a long time there may be but a moderate loss of weight. Later there is a steady emaciation.

This form of endocarditis is almost invariably engrafted upon an old mitral or aortic valvular lesion. It is important and curious to note how little change there may be in the physical signs of an ancient defect, although an autopsy may reveal large firm vegetations growing from the affected valve.

Among other symptoms, enlargement of the spleen can usually be demonstrated. Gastro-intestinal disturbances occur, generally of mild intensity. Pains in the joints, bones, muscles, or various nerves are very common.

Libman emphasizes the finding of tenderness over the lower part of the sternum. Slight swelling of the joints is by no means uncommon. Embolic phenomena may show themselves in the spleen, kidney, brain, skin, and other organs or parts. Embolic aneurisms have developed in a considerable number of instances. The urine not unfrequently contains blood, either in minute traces or visible to the unaided eye.

The cutaneous signs are important. Petechial spots develop in the majority of cases at some time during the course of the disease. The appearance of ephemeral cutaneous nodes is said by Osler to be pathognomonic of this form of endocarditis. They are small, raised, reddish lesions, somewhat resembling an ordinary wheal, and usually occur on the hands or feet. They are painful, but disappear in one or two days.

The diagnosis in the early stages of this disease is always difficult, and sometimes quite impracticable for weeks, or, in occasional instances even for months. An embolic attack may be the first significant signal of the endocardial origin of the fever and its hitherto associated symptoms. The fever may indeed be the only finding, and for the first few days, or for several weeks, the patient may not take to his bed. Typhoid fever, or a beginning tuberculosis is commonly diagnosed at the onset of the disease. The enlarged spleen and the blood examination have led to a diagnosis of splenic anæmia or Banti's disease in more than one case. The petechial spots have been considered as a simple purpura. The joint pain and swelling have been interpreted as a subacute rheumatism. A splenic infarct has been regarded as a splenic abscess, and the occasional hæmaturia as due to a pyelonephritis. Finally, when acute abdominal symptoms have occurred, operation has been done for a supposed appendicitis.

It is thus quite evident that the early diagnosis of subacute or chronic infective endocarditis is beset with difficulties. In every patient who is the subject of an old valvular lesion, and who presents a persistent, even though slight, fever of the septic type, a blood culture should be made, and incubated for at least six days. The finding of the quite characteristic streptococcus in the circulating blood makes a practically absolute diagnosis.

The prognosis is distinctly unfavourable. It is at least open to question whether one or two reported recoveries have really been instances of the disease. In at least one of these cases the blood culture was negative. It follows from this statement that no treatment is of any value. I have seen at least a dozen cases of this disease. In two of these both autogenous and stock vaccines were employed without in the least influencing the inevitably fatal course of the malady.

DISCUSSION.

Dr. William Charles White (Pittsburg) said: Dr. Butler has done an excellent thing in presenting a paper on this disease, which to-day is being more frequently diagnosed than before. In the past the condition was diagnosed as many things. During the past year I have seen two cases—one of which lasted some weeks, the other some months. The diagnosis had been tuberculosis in each case. While the fever was of a tuberculous type, there were no physical manifestations which showed that tuberculosis was really present. In one case it was easy to make the diagnosis from the blood culture, the enlarged spleen, and the polymorphonuclear leucocytosis, which amounted to 10,000 to 12,000. In both instances there was one thing that was very striking—the variability and shifting character of the lung signs. Streptococci were found in the blood cultures in one case only. While it is sometimes easy to find the streptococci in the blood culture, it is sometimes very difficult.

Dr. Charles L. Minor (Asheville, N.C.): In talking recently at Atlantic City with Dr. Libman, of New York, who has done such excellent work in this matter, he told me that he found that certain of the cases were not due to the streptococcus viridans, but to the

influenza bacillus, while Dr. E. C. Rosenow, of Chicago, told me that he found many of these cases were due to the pneumococcus, and that, moreover, by proper cultivation, he found that many of the streptococci in these cases could be cultivated over into pneumococci, which would speak of the possibility of polymorphism.

Dr. Libman's preparations showed very beautifully the fact that the lesions usually follow a definite course, that they began, for instance, on the aortic valve, they would cross to the mitral valve, then to the chordæ tendinæ, down these to the columnæ carnæ, and produce ulcerations along their course, at times cutting loose the tendon and giving rise to abnormal murmurs.

Dr. MORRIS MANGES (New York) said that all should be much indebted to Dr. Butler for bringing before them this interesting subject. These cases were not rare, and much work had been done on them by Dr. Libman at the Mt. Sinai Hospital in New York City. The picture was so characteristic, after seeing a number of cases, that one could not mistake them. There was one very characteristic feature, the petechiæ; as a rule they were not looked for, and therefore they were not found. One should carefully inspect the conjunctiva and the mucous membranes. Look at the mucous membrane, especially the eyelid, because they often were hidden there. He recalled a number of cases in consultation where merely the eversion of the lower eyelid revealing the petechiæ made the diagnosis. They were also to be found in the folds of the axilla. They came in bunches of six, eight, ten, or more small petechial spots, and they occurred in groups. He advised looking for them in these two places.

Dr. Manges called attention to what Dr. Osler had referred to, the painful nodes, easily recognized, but not as common as Dr. Osler claimed. These paronychial swellings were to be found alongside the big toe or on the hand, the favourite place being about the fingernails. They last four or five days, and then they disappear. They were absolutely characteristic of the disease, and even if one had nothing else to guide him, one could make a diagnosis without the making of a blood culture.

The blood cultures taken a dozen or more times might give negative results. Even if the blood cultures were negative, the diagnosis might nevertheless be correct.

With regard to the blood findings, one might obtain the attenuated streptococcus. Dr. Butler neglected to make mention of the gonococcus. Dr. Manges recalled one case in which there was a small ball on the flap of the mitral valve in which the gonococcus was demonstrated in the lesion. These were rare, but they did occur.

About the leucocytosis, they had rarely failed to find it, although the count was not very high, about 15,000. In these cases there was a polymorphonuclear leucocytosis.

About the physical signs, the point brought out by Dr. Butler he

believed to be correct. There were enormous changes in the vegetations, and yet the heart would go on for months, and manifest no physical signs except those that were due to a failing circulation.

At the Mount Sinai Hospital in New York, much work had been done in a study of the kidney lesions which occurred in this disease and the relation they bear to the prognosis. They found characteristic lesions in the kidneys which had already been described before the New York Pathological Society, occurring only in ulcerative endocarditis. Marchand had already made observations upon this point.

Another interesting point was brought out in going over a collection of kidneys; similar lesions were found which led to the conclusion that there were heart lesions which accounted for other lesions. Tracing these cases up, one would find that a number of them would have undergone a spontaneous cure. This makes it possible to revise the prognosis. Janeway and Portal had had the same experience. Portal published over 100 cases. The prognosis was most gloomy and possibly needed revision.

With regard to the vaccines, either stock or autogenous, they had been useless. Some cases had been treated by giving serum from other cases having the disease with the idea of increasing their immunity. The results were temporary, but not permanent.

With regard to remissions, they sometimes lasted over several months. After a time, however, the disease would resume its course and go on to the end.

Hæmorrhage was a curious feature of this disease, giving a clue to those who were not familiar with the disease. In one case which he recalled, hæmorrhage occurred into the lateral ventricle, and caused the death of the patient.

Dr. J. H. ELLIOTT (Toronto, Canada) said that one year ago he saw an interesting case which did not run a long course, but died at the end of about four months. The patient was a married woman, twenty-five (25) years of age, and who had a mitral stenosis. She played tennis, and developed what appeared to be an influenzal cold She afterwards was sent home with a diagnosis of typhoid fever. The fever persisted, she had cough, and the changes in the lungs suggested that possibly she might have tuberculosis. Yet there were no physical signs of tuberculosis other than occasional râles. They changed from day to day, and with the position of the patient. Finally a diagnosis of septic endocarditis was made. There was no change in the character of the heart murmur at any time. Signs of mitral insufficiency developed, and then embolism of the tibial artery, which was followed by dry gangrene of the extremities. Thrombus extended up the femoral artery. At autopsy the thrombus was found to extend through the iliac and one-half inch into the aorta, and there was a perforation of the mitral valves.

Dr. A. JACOBI (New York) said that Dr. Osler was the first to

draw attention to the fact that there was an entire absence of symptoms in a great many of the cases. In every case that he had seen in which there was an absence of symptoms, at autopsy this could be explained by the fact that the deposits were away from the edge of the valve, and so did not change the direction of the blood current. This probably was always the case. He did not believe anybody had mentioned the absence of symptoms in these cases before Dr. Osler.

Dr. GLENTWORTH R. BUTLER (Brooklyn, N.Y.) closed the discussion. He said that the paper was intended to be only a brief *résumé* of the subject. The cases he had seen were carefully studied. In the early stages there was a leucopenia rather than a leucocytosis. In the second stage a leucocytosis did make its appearance. In his series of cases it was not common in the ulcerative type.

Dr. Butler said that the subject was one of great interest to him, and he thanked all for their part in the discussion.

CARDIAC SYPHILIS WITH SPECIAL REFERENCE TO AORTIC ANEURISM AND REGURGITATION, AND THE VALUE OF THE WASSERMANN REACTION IN DETERMINING THEIR ETIOLOGY AND TREATMENT.

By ROBERT H. BABCOCK, M.D., LL.D.
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The inestimable value of the Wassermann test for syphilis is shown not alone by its being a means of diagnosis, but in its demonstration of the fact that treatment supposed to have eradicated the disease has in many cases only prevented the development of obvious lesions and thus lulled the victim into fancied security. Again, this test has served to clear up and establish the etiology of diseased conditions which had been more or less vaguely understood, but which now can be affirmed with certainty. This is especially true of certain neuroses and of some cardio-vascular conditions which even by the pathologists could not be definitely determined as due to lues. Of these latter this paper will deal particularly with those two clinically recognizable results of mesaortitis, aneurism and regurgitation. It may be remarked in passing that until possessed of this invaluable aid to diagnosis our ability to recognize syphilis of the myocardium was uncertain and rested mainly on the anamnesis or the discovery of suspicious lymph nodes or scars. It is likely, therefore, that many a case of cardiac syphilis

went unrecognized and hence missed the only means of therapy that could have offered a prospect of improvement.

For reasons just stated the real or even approximate infrequency of lues of the cardiovascular system has not been and even now may be said not to be appreciated by physicians and still less by the laity. Only recently are we beginning to realize that the spirochætæ may localize themselves exclusively and by selection in the heart muscle or the walls of the aorta. Thus Warthin,* in a very instructive contribution to this subject, has published two instances of congenital syphilis in young infants in which careful search for spirochætæ failed to discover them in any of the organs and tissues examined except in the heart muscle. He concludes, therefore, that these micro-organisms may display a selective action for this organ. This being the case is it not a fair assumption and borne out by clinical observation that acquired lues may likewise show itself years subsequent to the primary lesion, and in spite of supposedly effective treatment by disease only of the myocardium or aorta?

In his address on cardiac syphilis before the Chicago Medical Society, Warthin demonstrated that many cases of fatty degeneration of the myocardium are instances of myocardial lues as proven by the presence of spirochætæ in the degenerative foci. Within the past year I have had under observation two men in whom syphilis of the heart may be diagnosed with clinical assurance. In both there was a history of chancre many years before and both gave a positive Wassermann reaction. One complained of attacks of palpitation and intermittence of the pulse, examination of the heart failing to disclose anything more than slight enlargement. The symptoms yielded only to a vigorous anti-

* *Journ. of Amer. Med. Assoc.*, March 9, 1912, pp. 689-690.

syphilitic therapy, salvarsan and mercury. In the other case there are signs of great cardiac enlargement with a systolic aortic murmur and symptoms of inadequacy. The X-ray shows a dilatation of the aorta though not of the saccular variety. In this man there can be little if any doubt of a syphilitic degeneration of the heart muscle as well as of mesaortitis. His symptoms have always been mitigated by mercurial injections in addition to rest and digitalis. It is my conviction that had an equally reliable aid to diagnosis been at command in bygone years many another case of cardiac lues would have been recognized and more successfully treated.

The purpose of this paper, however, is to emphasize the etiological importance of lues in mesaortitis and its two sequels, aortic regurgitation and aortic aneurism. One who is not doing special work along this line can hardly appreciate the great frequency of what is known as the vascular type of aortic insufficiency. Its clinical findings are not essentially different from those of the rheumatic form, and its clinical recognition rests mainly on the age of the individual, the entire absence of a history of articular rheumatism or other acute infection likely to be followed by endocarditis, the stiffness perhaps of the accessible arteries and often a less pronounced degree of left ventricle hypertrophy as shown by the breadth and force of the apex beat. Not infrequently there is history of the accidental discovery of a cardiac murmur or of the onset of cardiac symptoms without any previous illness that could have in any way led to inflammation of the valves. The patient is generally at or past middle-age and is more often a male, although this type of the disease may be met with in women of the same age. Whenever, therefore, such an adult presents himself with signs of aortic leakage and close injury fails to elicit a history of articular rheumatism in earlier years or of

attacks of tonsilitis I at once suspect syphilis, and now am no longer astonished by the admission of a chancre either soft or hard years earlier. In such cases when possible, and in persons in whom history of luetic infection is possible but not definite, I advise a Wasserman test and rarely fail to obtain consent after having explained the advantages therapeutically at least of knowing what the reaction is.

On looking over my case records since the close of 1909, I find notes of sixteen cases of aortic regurgitation of the vascular type. (See Table I.) Of these sixteen cases eleven were submitted to the Wassermann test with a positive reaction in all. Of the remaining five a history of chancre was admitted in 4, while one was not questioned in regard to the possibility of lues and did not take a Wassermann. Fifteen of the sixteen cases accordingly could be attributed to syphilis, which is a percentage of 93.7. Is it any wonder, therefore, that I have come to suspect, nay, believe, all such cases due to luetic infection?

The bearing of such knowledge on treatment is well shown by the striking results in three instances. One, a negro butler, who gave a positive Wassermann, had been given treatment of the usual kind in a hospital two months previously with but moderate improvement. Upon consulting me his dyspnœa was so pronounced as to oblige him to discontinue work. The physical findings were those of free aortic regurgitation with beginning dilatation of the left ventricle. So soon as the Wassermann reaction had proved my suspicions correct he was put upon intramuscular injections and inunctions of mercury without any digitalis or other heart tonics. Improvement began almost at once and in less than three months to my astonishment the diastolic bruit had disappeared, leaving only a loud clanging second tone, while the previously indistinct apex beat had grown broad and forcible. The man declared he

felt well and was ready to return to work. I have not seen or heard of this patient in two years. The assumption in this case seems fair that the regurgitation had been due to aortic dilatation from mesaortitis, not to actual involvement of the valve, and that with repair of the aorta sufficient at least to permit a diminution of its dilatation the regurgitation was prevented.

In another case, that of a woman, the complaint was of pain, which, in the light of a classical aortic incompetence, I pronounced angina pectoris. There being no history of articular rheumatism or other infection to produce valvular disease a Wassermann test was advised and found positive. A vigorous course of mercury was instituted, and one month subsequently her physician reported the patient as doing well and nearly free from attacks of pain.

A third case still under observation was extremely dyspnœic and mentally very dull and inert. A vigorous course of mercury, chiefly by injections, and Merck's strophanthin in doses of 1-125 of a grain (0.0005 grm.), three times daily, laxatives and care in the matter of exercise, soon wrought marked improvement, and the man was able to return to work as manager of a department in one of our largest retail establishments. He has albuminuria, which at one time in conjunction with a severe cold seemed responsible for a moderate ankle œdema, but with this exception his condition is highly satisfactory. The heart is compensating fairly well and there is but little dyspnœa of effort.

During the same period of time, that is, since the end of 1909, I have seen ten cases of aortic aneurism (see Table II), the diagnosis in all being made by classical physical signs and confirmed by the skiagraph, in those giving rise to any doubt concerning the accuracy of diagnosis. Of these ten cases five gave a positive Wassermann reaction,

two admitted syphilis, two gave no history and were not submitted to a Wassermann, while one gave a negative reaction. In other words, in seven out of the ten cases, syphilis was clearly the etiological factor (70 per cent.). In the light of the cases of aortic insufficiency I am convinced that had the two cases without specific history been subjected to a Wassermann test they would probably have been found of luetic origin. These were all instances of saccular aneurism, uniform dilatation of the aortic arch not having been counted in since it seems probable that this may occur in senile arteriosclerosis without lues, although when such dilatation is encountered in a comparatively young individual I always suspect syphilis.

The results of mercurial treatment are not generally so marked as in regurgitation without saccular pouching of the vessel. But some striking effects have been noted. In three of the five patients giving a positive Wassermann, pain which had been the chief complaint, was controlled promptly and effectually. This leads me to remark by the way that the beneficial effects of iodide of potassium advocated by Balfour are to be attributed to the well-known influence of this drug over lues, but that according to my experience mercury by intramuscular injections is far more efficient for the relief of pain than is iodide of potassium, when of course the suffering is not due to pressure upon and erosion of the chest wall.

Nevertheless, one patient who presented a pronounced bulging tumour in the aortic area, obtained complete relief from pain after beginning his course of mercury, whereas potassium iodide for many months had failed to remove the symptom. In this case the beneficial effect of the mercury has not been limited to pain. The tumour, originally very soft and compressible, has become hard and resisting, and if not actually reduced in size certainly has not increased

within the last two years. In all other respects the man feels perfectly well.

There is nothing new or original in the observations here recorded. They are merely along the line of and corroborate reports by pathologists and clinicians in this country and Europe. W. T. Longcope,* in 1910, contributed two papers of interest and value from which I take the liberty to quote more or less directly. In his first paper he states that out of 938 autopsies there were twenty-one instances of mesaortitis with chronic aortic endocarditis that had led to the type of aortic regurgitation here considered. Whereas it cannot be stated that mesaortitis of the kind he describes is specific of syphilis, it nevertheless is so different macroscopically and microscopically from the changes of endarteritis deformans seen in advanced age that when found in comparatively young subjects it may be regarded generally as of luetic origin. This assumption appears borne out by the fact that the observers Wright, Reuter, Benda and Schmorl have, by using the Levadite method of staining discovered in the wall of the vessel spiral organisms identical with the *Spirochæta pallida.*

TABLE I.—REGURGITATION AORTIC.

	Wassermann	Infection	Age
Mr. H. A. S.	Positive	—	32
Mr. D. O'B.	Positive	—	53
Mrs. W. E.	Positive	—	35
Mr. G. H. R.	Positive	—	59
Mr. L. J.	Positive	—	51
Mr. J. L.	—	—	47
Mr. J. A.	Positive	—	38
Mr. J. D. McR.	—	Yes, syphilis	52
Mr. G. R. W.	—	Yes, syphilis	42
Mr. I. A. E.	Positive	—	55
Mr. S.	—	Admits syphilis	—
Mr. H. S. R.	Positive	16 years ago	37
Mr. P., coloured	Positive	—	32
Mrs. H. A. W.	Positive	—	54
Mr. J. A.	—	18 syphilis	58
Mr. J. C. K.	Positive	denied syphilis	49

* *Bull. of Ayer Clin.*, Lab. of Penn. Hosp., No. 6, November, 1910.

TABLE II.—ANEURISMS.

	Wassermann	Infection	Age
Mr. D. N., coloured	—	19 years ago	38
Mr. M. J.	Positive	40 years ago	58
Mr. C. H. P.	Positive	—	41
Mr. L. W.	—	20 years ago	48
Rev. Keifer	—	—	43
Mr. J. J. K.	—	—	45
Mr. A. J. K.	Positive	—	54
Mr. J. G.	Positive	—	53
Mr. W. E. van D.	Negative	—	58
Mr. S. C.	Positive	—	58

Aneurisms, ten cases; Wassermann positive in five, negative in one, not made in four, of which two give a history of syphilis and two no record of syphilis.

Aortic regurgitation, sixteen cases; Wassermann positive in eleven, not made in five, of which four admitted syphilis, one no history.

It is not necessary here to describe minutely the changes found in syphilitic mesaortitis, but it may be stated that areas of degeneration and calcification are wanting. Moreover, the changes are said to be limited to the arch of the aorta and often to a small portion of the ascending limb directly above the valves. They consist briefly of cellular thickening of the intima, which to the naked eye presents circumscribed areas of a whitish yellow, succulent and raised appearance, surrounded by a zone of corrugations or crinkling, in which small pits or saccular dilatations may be found, the foci being rather sharply defined and the lining of the vessel beyond being smooth and healthy. The adventitia is also infiltrated with cells, and in some instances is separated from the intima by only vascularized, scar-like remains of the media. So that the middle coat is the one that seems to suffer most, its elastic and muscle fibres having disappeared and become replaced by giant and small plasma cells. It thus favours an aneurismal dilatation of the diseased focus. It is found further that the aortic cusps have shared in the process presenting a thickened rubbery

appearance, while the endocardium beneath may show crescentic areas of a yellowish colour.

Thus it is plain that when the spirochætæ localize themselves in the arch of the aorta they produce changes calculated to result in aneurism with regurgitation in most instances or in regurgitation without demonstrable clinical signs of dilatation sufficient to merit the term aneurism.

As regards the frequency of a positive Wassermann reaction in uncomplicated aortic insufficiency of the vascular type let me quote the figures given by Longcope. Including his own twenty-seven cases there were reported up to the publication of his paper 182 instances with 135 positive Wassermann reactions, a percentage of 74.1. Of his own twenty-seven cases, nineteen, or a percentage of 75.9, gave a positive reaction, while of the other eight with a negative reaction the aortic lesion was rheumatic, as shown either by history and autopsy or by the association of the aortic regurgitation with lesions at the mitral orifice. Adding my sixteen cases with eleven positive reactions we have a total of 198 cases with 146 in which a positive reaction has been obtained, 72.7 per cent.

There seems to be an inclination on the part of some writers to doubt the reliability of the Wassermann reaction, and hence as Longcope states it would be most valuable if an autopsy could be had in every case giving a positive reaction during life. This is, of course, impossible, and hence we must exercise individuality in our opinion concerning its diagnostic value. Longcope states that in three of his series that gave a positive reaction and afterwards came to autopsy, spiral organisms identical with spirochætæ were found in the sections from the aorta and valve stained by the Levadite method. When in connection with such evidence I consider that in all of my eleven cases showing a positive Wassermann a history of chancre was admitted,

I am satisfied that in pure and uncomplicated aortic insufficiency of this vascular type the etiological factor is syphilis. They convince me, moreover, that when in such cases a reliable history or trustworthy signs of luetic infection can be obtained I am justified in regarding them as syphilitic even without the corroborative evidence of a positive Wassermann.

On the other hand, it should be stated that lesions of other valves than the aorta and lesions of other orifices or valves combined with aortic incompetence may generally be regarded as non-syphilitic. This statement seems warranted by the frequency with which in such cases a history of articular rheumatism is obtained and by the figures of Pearce,* who in thirty-four cases of other valvular lesions than the one now discussed obtained a positive reaction in only eight, or 2.32 per cent. Collins and Sachs† in eleven cases of uncombined mitral disease obtained a positive reaction in only two, or 1.8 per cent.

Now what may be said as to treatment of cardiac syphilis? It is apparent that no sort of medication is capable of restoring tissues destroyed by the spirochætæ. Areas of fatty degeneration and fibrosis in the heart muscle cannot become replaced by normal contractile elements. Neither can the aortic valve or the aortic coats become elastic and competent on the one hand, or made to contract down and resist the dilating force of the blood-stream on the other. So far as pathological changes are concerned the most we can hope to do is to check their progress and destroy the spirochætæ *in situ*, thus preventing still further damage. Gummata may be absorbed and nature given a chance to replace cellular by fibrous elements which may serve to strengthen or reinforce weak walls.

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* *Arch. of Int. Med.*, 1910, vi, 478.
† *Amer. Journ. of Med. Sci.*, 1909, cxxxviii, 384.

But aside from such effects we are able to ameliorate or remove distressing subjective symptoms, and even obtain manifest improvement in objective findings, as exemplified in the case of the negro whose aortic leak was stopped and in the instance of the aneurism which has ceased to increase in size and has become firm and resisting. Accordingly from all points of view we are called on to institute vigorous antiluetic treatment so soon as we are convinced of the correctness of our etiological diagnosis.

The query at once arises, shall we give mercury or iodine? For my part there is no hesitation in my answer; mercury, and push it to the limit of toleration as rapidly as possible. It kills the spirochætæ, and iodine does not. It is not my purpose or province to discuss details of treatment, but I do desire to say that I regard the internal and old-fashioned administration of biniodide or protoiodide of mercury as a delusion and a snare. Intramuscular injections and inunctions are the only two practicable methods of rapidly saturating the system with mercury. Salvarsan is, of course, highly, nay immensely, powerful against the organism of syphilis, but in serious heart cases, must be used, if at all, with caution and moreover does not kill all the spirochætæ in the inaccessible recesses of the tissues. Therefore, salvarsan must be administered more than once and must be supplemented by mercury over a long period. Finally, treatment of whatever kind must be continued until a negative Wassermann reaction is obtained.

When serious cardiac incompetence is present this antisyphilitic medication must be supplemented by physical rest, digitalis and such other measures as are applicable to cardiopaths in the absence of lues. It is my conviction that if this line of management is carried out vigorously and intelligently the results will be found most gratifying, and even astonishing.

The foregoing remarks concern cases that may be classified as manifestations of late syphilis, but let me now take up briefly the question, does lues in the secondary stage affect the heart? We are so prone to consider visceral changes as limited to, or at least recognizable in the so-called tertiary stage as to overlook the possibility of serious organic disease at an earlier period. But clinicians and pathologists are coming to recognize that visceral changes may be seen as part of the secondary manifestations of lues. This is no less true of the heart and aorta than of the nervous system, mucous membranes or skin.

Thus Brooks* agrees with Grassman and others in the opinion that serious cardiac disease may develop as early as the fore part of the secondary stage, and he mentions two of his cases that prove this conclusively. In one aneurism developed as soon as six months after the initial lesion, and in another death occurred from perforation of an aneurismal dilatation of one of the sinuses at the beginning of the secondary skin eruption, even before a conclusive diagnosis had been reached.

From such and other considerations it is reasonable to assume that gross changes discovered at a late period in syphilis, that is, late not in time but in pathology, begin soon after the spirochætæ have gained access to the general circulation. Consequently, whenever we have charge of a patient with only the primary lesion and still more with secondary manifestation of this insidious and malign infection, we should bear in mind the likelihood of incipient visceral disturbance and be on the unceasing lookout for signs of functional derangement by which alone perchance we may recognize and forestall more serious results.

Accordingly the lesson to be drawn from all this is that

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* Study of the heart in syphilis. *Medical Record*, February 24, 1912.

we must impress our patients with the imperative necessity of a vigorous and prolonged course of medication. Much of the suffering seen in late lues might be avoided if only we could convince our patients, and yes, ourselves, that the battle is not won so soon as all the visible traces of the infection are removed. It is my opinion that we should resort from time to time to a Wassermann test to determine what success has attended efforts at eradication of this subtle and obstinate malady and that this reaction is proving that the old contention, namely, the incurability of syphilis is not far from correct. Certain it is that if we would destroy all the spirochætæ within the body, we must assault them before they have embedded themselves, so to speak, in the tissues. Hence, if we will cure the cardiopathies due to syphilis we must prevent their occurrence by attacking the infection early and keep up our fight so long as a positive Wassermann reaction is obtained, for when aortic aneurism or regurgitation or syphilis of the myocardium has been produced we can only ameliorate and not eradicate the condition.

Postscript.—Since the above paper was read at the meeting of the American Climatological Association in Hartford, in June last, there has appeared in the *Journal of the American Medical Association*, August 10, 1912, a contribution to this subject by Cummer and Dexter, of Cleveland, Ohio, entitled "The Relation of Aortitis to Syphilis and the Importance of its Recognition." They analyse thirty-six cases, of which twenty-seven, or 75 per cent. gave a positive Wassermann reaction. In commenting on these twenty-seven cases they remark that "the proportion is almost identical with that which Longcope reports in his collected cases. When

it is remembered that a negative Wassermann reaction cannot be interpreted as evidence against an old luetic infection, it is apparent that the actual proportion of cases with a luetic basis is undoubtedly greater than our figures would represent."

The foregoing citation is made to emphasize the opinion expressed in my paper to the effect that all cases of aortic aneurism and probably the overwhelming majority, if not all instances, of aortic insufficiency of the vascular type, in contradistinction to those of endocarditic origin, may be regarded as having a syphilitic etiology and are to be treated accordingly in an energetic manner either with or without other medication according to indications.

DISCUSSION.

Dr. De Lancey Rochester (Buffalo, N.Y.), said he was especially interested in Dr. Babcock's paper, because during the last year in Buffalo they had made some interesting observations among their hospital cases. Out of twelve patients with aortic disease seven gave a positive Wassermann reaction. Two of the seven gave a previous history of rheumatism. This year they practised giving the Wassermann test in every cardiac case that entered his service.

Dr. Rochester said he had always had excellent results from intramuscular injections, and would like to add his testimony to the value of the procedure in this use of mercury rather than the giving of it by mouth. When patients had been taking this treatment and left before it was completed they were ordered inunctions of mercury, and told to be sure to return and report. Sometimes they did, and sometimes they did not.

Dr. James M. Anders (Philadelphia, Pa.), said that Dr. Babcock had presented a very difficult subject in a most interesting way; it was one about which the general profession seemed to know very little. As stated, syphilis undoubtedly showed a selective action for the myocardium. Both the endocardium and the pericardium might be secondarily involved as a direct extension of the morbid process. The root of the aorta was the seat of syphilitic lesions which led to dilatations or aneurisms. Formerly the diagnosis of cardiac syphilis was extremely difficult, and, so far as he personally was concerned,

it was made by exclusion. But since the introduction of the Wassermann reaction, a reliable means for recognizing syphilis of the viscera was available, and the diagnosis was much more readily made than formerly. He agreed with Dr. Babcock that cardiac syphilis was, as a rule, a late or tertiary manifestation, occurring five or ten years after the initial infection. It might be an early manifestation, but this must be rare.

In cases of aortic regurgitation, Dr. Babcock mentioned that after excluding rheumatism as the probable cause of the condition, one might safely infer that the chief causative factor was syphilis. But he thought that in cases of this kind they should not only exclude rheumatism, but the effect of occupation as well. Occupation was one of the leading causes of aortic regurgitation. This was also the view of other clinical observers.

There was another interesting group of cases in which angina pectoris occurs in patients under forty years of age; these were due to syphilis, as a rule. Even before the introduction of the Wassermann test, the treatment of these cases for syphilis yielded good results.

Not all cases of sacculation of the aorta were due to syphilis, but the majority of them were. He recently saw a case in which there was a history of previous infection; the subject was a young individual. The man had tertiary syphilis, and yet the Wassermann reaction test was negative, while after salvarsan was given intravenously the reaction became positive. It seemed that the spirochætes were too few, as other observers have found in similar cases, to bring about the reaction.

Dr. Judson Daland (Philadelphia, Pa.), said that Dr. Babcock's communication was very interesting, and there were a number of questions for discussion, which was particularly proper for the Association.

With regard to classification one point he agreed with, namely, that aneurism, especially sacculation, was not an ordinary dilatation. With regard to syphilis of the heart from the standpoint that the heart was where the *Spirochætæ pallida* collected, what was said he agreed with, but he wished to lay particular stress upon syphilis of the vessels themselves. There seemed to be a predisposition for the spirochætæ to endanger the circulatory apparatus even more than the heart itself.

Dr. Babcock's statistics were very closely in accord with those expressed by most observers in Europe. Since the introduction of the Wassermann reaction he had studied the question more carefully, and he had not been able to absolutely confirm the statements made in Philadelphia that cardio-vascular diseases, syphilitic in origin, were more frequent here than in Europe; he compared their statistics with the European statistics. Diseases of the heart and blood-vessels were extremely common, and he was surprised to find, however, that

they were less common in his experience here than in experience gained abroad. There was one factor in the United States which should be considered in these cases, and that was occupation, which played such an important *rôle* with them.

Another point was the frequency of cases with hypertension causing changes in the heart and circulatory system. They should bear in mind that syphilis was a very common cause of aortic disease, and also that it played a less common *rôle* in the etiology in the United States than in Europe. The value of mercury in these cases Dr. Babcock had already touched upon.

There was another important point Dr. Daland wished to refer to, and that was the relationship of salvarsan to the condition. He referred to one intramuscular injection being given in one case with benefit, and also pointed out the dangers arising from the use of salvarsan. When one examined into the number of deaths from the use of salvarsan, it would be found that the majority of them occurred in those who suffered from myocardial degeneration. Sometimes the diagnosis was made prior to the injections, and sometimes not.

Dr. Daland felt that the intravenous injection of salvarsan was hazardous and dangerous in cardio-vascular syphilis, and he practically had forbidden its use. There were a few cases, however, in which it might be given in small quantities, injected into the gluteal muscles, but even this he allowed with reluctance. It was only very occasionally that he allowed such procedure to be resorted to, and only in exceptional cases. One could not lay too much stress upon the possibility of death occurring either suddenly or after a few days after the intravenous injection of salvarsan in advanced cases of cardiac disease of syphilitic origin.

Dr. ARTHUR K. STONE (Boston, Mass.) said that at the meeting of the Society at Old Point Comfort in 1909, he had demonstrated preparations of syphilitic aortitis made by Dr. Wright, of the Massachusetts General Hospital, which showed the spirochætæ in large numbers. So far as he knew, this was the first preparation of the kind made in this country. Dr. Wright had made a series of similar preparations from cases of aortitis, and had demonstrated the spirochætæ in them all. Hence it had become axiomatic at the Massachusetts General Hospital to consider all cases of aortitis and aortic valvular disease coming on after the age of forty without acute infective cause as syphilitic.

In regard to the Wassermann reaction, he believed that many persons had done many modifications of the true reaction, and that one must be very critical of the work that is done, and how it is done. On the whole, from this work of Wright's, he believed it better to consider all these cases of aortitis as syphilitic, and proceed accordingly, than to rely on the Wassermann reaction, as was usually done.

With regard to the treatment, he said he had seen cases improve rapidly and then suddenly go to pieces, and at autopsy it would be

shown that it was impossible to have done very much, so extensive were the lesions. A certain number of these cases would improve with salvarsan or other anti-syphilitic treatment. He said he had seen two cases in six months, each with an enormous aneurism of the aorta; these patients had been given salvarsan intravenously and no ill-effects had occurred, and they said they experienced great relief. Why, he did not know. The reason for giving the salvarsan was that they had said, "For God's sake, do something for me!" The results in these two cases from the use of salvarsan were very satisfactory, and there were no ill-effects excepting a localized œdema of the arm in one case. One of them had already died, but after several months of relief from pain and discomfort.

Dr. J. H. ELLIOTT (Toronto), asked Dr. Babcock if he believed that occupation played any *rôle* in the development of these aneurisms. Was not occupation merely a determining cause?

In many of these cases the Wassermann reaction would be positive when done by competent men, but the technique must be perfect.

With the use of salvarsan in these cases he said he had had very little experience, although they used it in the hospital in various forms of syphilis. He said he was surprised to hear Dr. Babcock speak against its use intravenously and advise it intramuscularly. The pain caused by intramuscular injections of salvarsan was often intense, and sloughing might follow, but he had seen no ill-effects from the intravenous use of it.

Dr. BABCOCK, in closing the discussion, said: In answer to Dr. Daland's remark concerning dilatation of the aorta, I may say I recognize that it may be due to syphilitic mesaortitis the same as is saccular aneurism, and in my paper is mentioned such a case. In this man the physical signs were those of uniform dilatation of the arch, and its specific nature was proved by both history and the results of mercurial treatment. As to why I tabulated only instances of saccular aneurism, I can only say I did so because in such cases the signs are usually unmistakable, and leave no room for dispute.

As to occupation being a cause of aortic aneurism, I can say I have never seen a case in which occupation seemed the sole causative factor, although I can understand that in old people with aortic sclerosis of the deforming type aneurism might result from strain. But I doubt seriously that in the young the aortic coats can give way without some underlying pathological lesion. The healthy aorta can, I believe, withstand any degree of internal pressure to which it can be subjected by physical exertion. I will not dispute the possibility of aneurismal dilatation from occupation alone, but it does not appeal to me as likely. Dilatation of the aorta sufficient to occasion insufficiency of the valve may result from strain, such a dilatation subsequently disappearing, but when such dilatation and regurgitation are permanent, I think it probable that some pathological condition preceded and was a predisposing factor.

As to the case of the young individual mentioned by Dr. Anders, in whom the Wassermann reaction was negative, I am disposed to doubt the accuracy of the test. The Wassermann reaction is reliable in its positiveness, and not in its negativeness, for an individual may have had and still have syphilis, and yet the reaction be negative. Therefore, this reaction should never be depended on unless the test is made by a worker whose methods are absolutely reliable.

I do not believe, of course, that anti-syphilitic medication will relieve all cases, for one cannot expect any treatment to cure an area of fatty degeneration in the heart muscle, for such a degeneration cannot be replaced by normal elements, and the same remark applies to the aortic wall. Vigorous treatment may relieve subjective symptoms, and gives a chance for restoration of compensation when employed in conjunction with rest and administration of other remedies.

As to the use of salvarsan, I must say I have grown more conservative and even timid than formerly, and as it would be most unpleasant to have a patient die after the intravenous injection of this agent, I have never prescribed it in this manner in cases of heart or aortic disease. Even its intramuscular injection is attended with the possibility of sloughing of the buttocks, as in cases I know of, and hence in the future I shall warn a patient of this possibility, and make him sign a paper stating he knows the risk and is willing to incur it.

THE INFLUENCE OF CARBONATED BRINE (NAUHEIM) BATHS ON BLOOD-PRESSURE.

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Last year I read a paper before this Society, entitled "A *Résumé* of the Opinions upon the Nauheim Treatment of Chronic Disease of the Heart" [1]. In the course of that paper I referred to the following statement made by Mackenzie [2]: "I found that from ten to twenty years ago, when the notion was prevalent that to have a good heart you must have a strong pulse, these baths had a remarkable effect in strengthening the pulse, raising the arterial pressure 20, 30, and 40 mm. Hg. But nowadays the fashion being to soften a strong pulse, these waters are discovered to have a remarkable effect in lowering the arterial pressure. So remarkable are these waters that it is averred that they can increase the pressure when it is low and lower the pressure when it is high."

Huchard [3] quotes a statement by Bosia: "We have read all the works of Schott and in no part of these have we met precise observations, always affirmations, never facts." Huchard agrees with this statement, and protests against similar exaggerations. He refers to several cases of sudden death of patients who had just returned from a course of treatment at Nauheim which he reported at the Académie de Médicine. He says that he is not an enemy

of carbon dioxide baths in suitable cases of cardiac disease, but that he is opposed to the systematic medication of all cardiac patients.

In the paper which I read at this Society in 1911, I said: "The influence of carbonated brine baths on blood-pressure in the human patient, so far as I know, has never been carefully studied. I have a series of observations on this subject under way at present, which I hope to report at some future day. I am able to say, however, that while the majority of patients show a higher pressure at the conclusion of the baths than at their commencement, there are some patients in whom the pressure has been lower at the termination of the series. I am not unmindful of the numerous other influences that would tend to modify the blood-pressure at work in a patient who is taking a course of sanatorium treatment."

In the present communication I wish to report the observations made upon the blood-pressure in eighty-one patients who were treated with carbonated brine baths.

Material: The patients who form the basis of this study were under my care while I was Medical Director of the Glen Springs.

In five cases observations were taken either by myself or by one of my associates, before the administration of the bath, immediately after the bath, and after one hour's rest.

In the remainder of the cases observations were made at the beginning of the treatment and at its conclusion.

In twenty-one cases the course of carbonated brine baths was interrupted before the completion of the routine number of baths in the series for one reason or another. In several cases the patient found it necessary to leave the institution. In the remainder of the eighty-one cases the complete series of eighteen baths was given.

Fifty of the patients were males and thirty-one were females. Their ages ranged from 19, the youngest, to 77, the oldest; two of the patients were 77 years old.

They were distributed through decennial age periods as follows: Under 20, one; from 20 to 29, six; from 30 to 39, thirteen; from 40 to 49, ten; from 50 to 59, twenty-four; from 60 to 69, seventeen; over 70, ten.

There were sixteen cases of fibroid myocarditis, three of which were complicated by bronchitis; nine cases of parenchymatous myocarditis; eleven cases of dilatation of the heart; five cases of hypertrophy and dilatation of the heart; five cases of mitral regurgitation; five cases of hypertrophy of the heart; four cases of tachycardia; three cases of aortic regurgitation; three cases of convalescence from acute infections; two cases of arteriosclerosis; two cases of neurasthenia; two cases of convalescence from operations; two cases of arthritis deformans; and one case each of mitral obstruction and regurgitation, diabetes mellitus, beginning interstitial nephritis, hypertrophic cirrhosis of the liver, chronic parenchymatous nephritis, mitral regurgitation and aortic regurgitation, fat heart, hypochondriasis, weak heart, pulmonary emphysema, gastrectasia, and nervous dyspepsia.

Methods.—A physical examination was made of each patient at the time he applied for treatment and another physical examination was made usually on the day after the completion of the course of baths. The protocols of these examinations record the location of the point of maximum intensity of the cardiac impulse; the outline of the superficial area of cardiac dulness; the description of adventitious sounds, if any were found; the character of the diastolic sounds; the character of the muscular quality of the systolic sound; the extent of the superficial area of liver dulness; observations of the blood-pressure; and the

rate and character of the pulse. Early in the course of the routine examinations, I located the borders of cardiac dulness and the point of maximum impulse with relation to the midclavicular line. Later I located these points with reference to the midsternal line, measuring the distance from that line in inches. At the beginning of my routine examinations I made no attempt to record the size of the area of cardiac dulness; later I began to record the transverse diameter of this area in inches; and still later I recorded the oblique diameter of this area in inches. The oblique diameter was measured from the point of junction of the right border with the upper border of cardiac dulness, to the point of maximum impulse.

The blood-pressure observations were all made in the recumbent posture. The cuff was always applied next to the skin of the arm. A Stanton sphygmomanometer was always used. The auscultatory method of determining blood-pressure was used. The systolic pressure was recorded as the point at which the first tap was heard. The diastolic pressure was recorded as the point at which the tap disappeared.

The details of the method of administering the baths will be found in a paper which I read before the Medical Society of the State of New York, in 1911 [4].

In the case of a male patient (Case 1), aged 76, who was suffering from fibroid myocarditis, blood-pressure observations were made just before entering the bath-tub, immediately after the bath was given, and after one hour's rest in the recumbent posture. The accompanying table (Table I) gives the details of these observations.

Before the first bath the patient's systolic pressure was 142 mm., before the last bath in the series his systolic pressure was 135 mm., and an hour after the last bath his systolic pressure was 154 mm. The accompanying chart

(Chart 1) of the fluctuations of the systolic pressure indicates that the tendency of the pressure during the course of treatment was upward.

The usual train of circumstances in this case was to find that the systolic pressure was higher immediately after the bath than it was before the bath was given, and after the hour's rest to find it lower than it was before the bath was given. This train of events followed in ten instances.

TABLE I.—FIBROID MYOCARDITIS.

Blood-pressure Observations.

	Before				After				One hour after			
	S.	D.	M.	PP.	S.	D.	M.	PP.	S.	D.	M.	PP.
1st bath	142	85	113.5	57	144	80	112	64	137	85	111	52
2nd ,,	145	85	115	60	148	85	116.5	63	139	90	114.5	49
3rd ,,	137	86	111.5	51	148	83	115.5	65	135	90	112.5	45
4th ,,	Observations missed											
5th ,,	142	90	116	52	158	92	125	66	138	92	115	46
6th ,,	145	82	113.5	63	145	85	115	60	123	75	99	48
7th ,,	138	78	108	60	154	82	118	72	148	83	115.5	65
8th ,,	144	82	113	62	160	83	121.5	77	149	85	117	64
9th ,,	157	78	117.5	79	155	84	119.5	71	155	82	118.5	73
10th ,,	125	70	97.5	55	148	82	115	66	135	80	107.5	55
11th ,,	125	97	111	28	130	77	103.5	53	131	75	103	56
12th ,,	140	95	117.5	45	137	95	116	42	145	88	116.5	57
13th ,,	130	83	106.5	47	138	78	108	60	Observation missed			
14th ,,	149	92	120.5	57	155	82	118.5	73	162	85	123.5	77
15th ,,	150	86	118	64	158	86	122	72	147	91	119	56
16th ,,	143	80	111.5	63	165	95	130	70	148	84	116	64
17th ,,	134	80	107	54	145	78	111.5	67	142	82	112	60
18th ,,	135	80	107.5	55	153	80	116.5	73	154	84	119	70

At the sixth bath the systolic pressure was the same after the bath as it was before; an hour after the bath there was a drop of 22 mm.

At the ninth bath the systolic pressure after the treatment was 2 mm. lower than it was before; and one hour after the treatment it was the same as it was immediately after.

At the eleventh bath the systolic pressure immediately after the treatment was 5 mm. higher than it was before.

After the hour's rest it was 1 mm. higher than it was immediately after the bath.

After the twelfth bath the pressure fell 3 mm., and after the hour's rest it had risen 8 mm.

At the fourteenth bath the systolic pressure was 6 mm. higher immediately after than it was before the bath was given. After an hour's rest it was 7 mm. higher than it was immediately after the bath was given. At the eighteenth bath the systolic pressure rose 18 mm., and after an hour's rest it rose 1 mm.

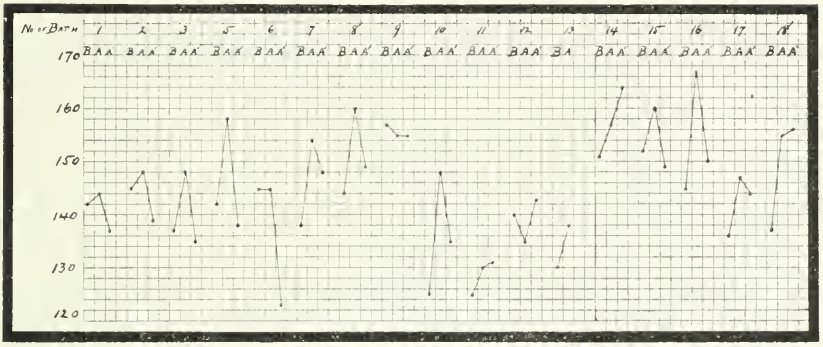

CHART 1.—Systolic blood-pressure curve. Carbonated brine baths. Fibroid myocarditis. B = Immediately before bath. A = Immediately after the bath. A′ = One hour after the bath. The observations at the fourth bath and the observation one hour after the thirteenth bath were missed.

The immediate effect of the bath was to raise the pressure fourteen times, to lower it twice, and no effect was noted once. The observations at the fourth bath were unfortunately missed. The increases of systolic pressure immediately after the baths amounted to 2 mm., 3 mm., 11 mm., 16 mm., 16 mm., 16 mm., 23 mm., 5 mm., 8 mm., 6 mm., 8 mm., 22 mm., 11 mm., and 18 mm., respectively; an average of 11.7 mm. at each treatment. The decreases of the systolic pressure amounted to 2 mm. after one bath, and 3 mm. after the other.

After the hour's rest the systolic pressure was higher in nine instances and lower in seven than it was before the bath was given. The observation one hour after the thirteenth bath was unavoidably missed. The increases of the systolic pressure an hour after the bath amounted to 10 mm., 5 mm., 10 mm., 6 mm., 5 mm., 13 mm., 5 mm., 8 mm., 19 mm., respectively, an average of 9 mm. after each treatment. The decreases of the systolic pressure one hour after each bath amounted to 5 mm., 6 mm., 2 mm., 4 mm., 22 mm., 2 mm., 3 mm., respectively; an average of 6.2 mm. for each treatment.

At the beginning of the course of treatment the patient's pulse-pressure was fifty-seven; before the last bath his pulse-pressure was fifty-five; immediately after the bath it was seventy-three; and after an hour's rest it was seventy.

The usual train of events in relation to the pulse-pressure was to have a well marked elevation immediately after the treatment and a depression after the hour's rest. (Chart 2.) This train of circumstances followed eleven of the treatments. At the sixth bath the pulse-pressure was 3 mm. lower immediately after the treatment and 12 mm. lower after the hour's rest.

At the ninth bath the pulse-pressure was 8 mm. lower immediately after the treatment and after the hour's rest it had increased 2 mm.

At the eleventh bath there was an elevation of pulse-pressure of 25 mm. immediately after the bath, and after the hour's rest there was a further elevation of 3 mm.

After the twelfth bath the pulse-pressure was depressed 3 mm. immediately, and there was an elevation of 15 mm. after the hour's rest.

Immediately after the bath the pulse-pressure was elevated fourteen times and lowered three times. The elevations amounted to 7 mm., 3 mm., 14 mm., 12 mm., 15 mm., 11 mm.,

25 mm., 13 mm., 16 mm., 8 mm., 7 mm., 13 mm., 18 mm. respectively; an average of 12.5 mm. for each treatment.

The lowering of the pulse-pressure amounted to 3 mm., 8 mm., and 3 mm. respectively; an average of 4.6 mm. for each treatment. An hour after the bath the pulse-pressure was elevated eight times, lowered seven times, and unchanged once. The elevations of pulse-pressure amounted to 5 mm., 2 mm., 28 mm., 12 mm., 20 mm., 1 mm., 6 mm., and 15 mm. respectively; an average of 11.1 mm. for each treatment.

The depressions of the pulse-pressure amounted to 5 mm.,

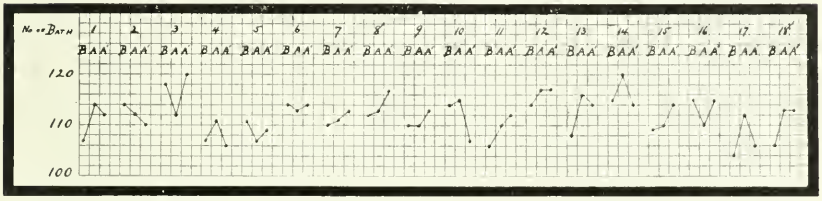

CHART 3.—Systolic blood-pressure curve. Carbonated brine baths. Parenchymatous myocarditis. B = Immediately before bath. A = Immediately after the bath. A' = One hour after the bath.

11 mm., 6 mm., 5 mm., 15 mm., 6 mm., and 8 mm. respectively; an average of 8.1 mm. for each treatment.

In this patient the systolic pressure on admission was 142 mm., and during the course of his treatment it increased to 165 mm. on one occasion, and was above 150 mm. on thirteen occasions. The highest increase of systolic pressure at any one treatment was 23 mm.

He had a hypertrophied heart and a fibroid myocarditis. He had a pulse of normal rate, of good strength and volume, and an artery which was recorded as not palpable at the beginning of the treatment and palpable at its close. It may be supposed that in this patient the fibroid changes in

the heart muscle had increased much faster than the thickening of the walls of the peripheral vessels.

The danger of administering a form of treatment capable of producing an elevation of the systolic pressure of 22 and 23 mm., and of 25 to 28 mm. of the pulse-pressure to an individual with thickened and rigid arteries is not, in my opinion, altogether theoretical.

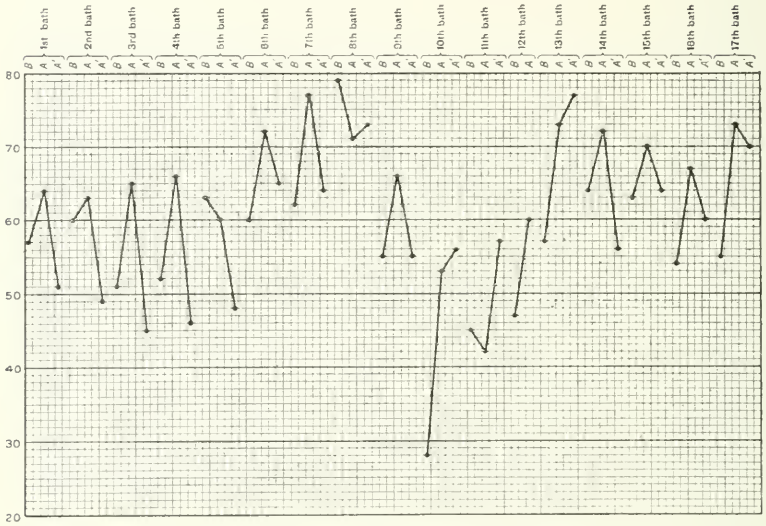

CHART 2.—Pulse-pressure. Carbonated brine baths. B = Immediately before the bath. A = Immediately after the bath. A′ = One hour after the bath. Observations at the 4th bath missed. Observation one hour after 13th bath missed.

In the case of a female, aged 26 (Case 16), who was suffering from parenchymatous myocarditis, the observations made before, after, and one hour after the bath are given in Table II.

In this case there was usually an elevation of systolic pressure (Chart 3) immediately after the bath, and at the end of the hour's rest the systolic pressure was usually higher

than it was before the bath was given, although often lower than immediately after the treatment.

Immediately after the bath the systolic pressure was elevated eleven times, reduced six times, and was unchanged once. The elevations of pressure amounted to 7 mm., 4 mm., 1 mm., 1 mm., 4 mm., 3 mm., 8 mm., 5 mm., 1 mm., 8 mm., and 7 mm. respectively; an average of 4.2 mm. for each treatment.

TABLE II.—PARENCHYMATOUS MYOCARDITIS.

Blood-pressure Observations.

No. of bath	Before				After				One hour after			
	S.	D.	M.	PP.	S.	D.	M.	PP.	S.	D.	M.	PP.
1	107	55	80.5	52	114	55	84.5	59	112	58	85	54
2	114	60	87	54	112	58	85	54	110	58	84	52
3	118	55	86.5	63	112	60	86	52	120	62	91	58
4	107	58	82.5	49	111	62	86.5	49	106	47	76.5	59
5	111	55	83	56	107	64	85.5	43	109	55	82	54
6	114	55	84.5	59	113	58	85.5	55	114	54	84	60
7	110	63	86.5	47	111	68	89.5	43	113	65	89	48
8	112	58	85	54	113	65	89	48	117	70	93.5	47
9	110	52	81	58	110	60	85	50	113	60	86.5	53
10	114	45	79.5	69	115	50	82.5	65	107	48	77.5	59
11	106	53	79.5	53	110	58	84	52	112	55	83.5	57
12	114	54	84	60	117	60	88.5	57	117	57	87	60
13	108	64	86	44	116	70	90	46	114	70	92	44
14	115	75	95	40	120	65	92	55	114	80	97	34
15	109	60	84	49	110	70	90	40	114	83	98	31
16	115	55	85	60	110	60	85	50	115	55	85	00
17	104	57	80.5	47	112	64	88	48	106	65	85.5	41
18	106	64	85	42	113	64	88.5	49	113	64	88.5	49

The reductions in systolic pressure amounted to 2 mm., 6 mm., 4 mm., 1 mm., 1 mm., and 5 mm. respectively; an average of 3.1 mm. for each treatment.

One hour after the bath the systolic pressure was raised eleven times, reduced five times, and unchanged twice. The elevations amounted to 5 mm., 2 mm., 3 mm., 5 mm., 3 mm., 6 mm., 3 mm., 6 mm., 5 mm., 2 mm., and 7 mm. respectively; an average of 4.2 mm. for each treatment.

The reductions of systolic pressure amounted to 4 mm., 1 mm., 2 mm., 7 mm., and 1 mm. respectively; an average of 3 mm. for each treatment.

The influence on the pulse-pressure (Chart 4) in this case was usually a decrease in the pressure immediately after the treatment, followed by an elevation after an hour's rest after half the treatments, and a depression after the other half. The pulse-pressure was 3 mm. lower at the conclusion of the series than it was at the beginning.

Immediately after the baths the pulse-pressure was

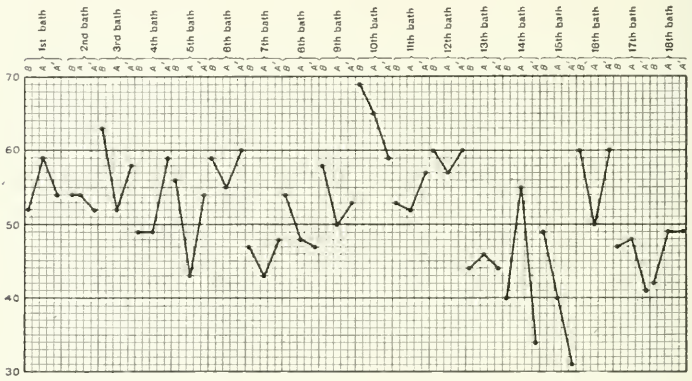

CHART 4.—Pulse-pressures. Parenchymatous myocarditis. Carbonated brine baths. B = Before the bath. A = Immediately after the bath. A′ = One hour after the bath.

elevated five times, reduced eleven times, and no change was noted twice. The elevations amounted to 7 mm., 2 mm., 15 mm., 1 mm., and 7 mm. respectively; an average elevation of 6.3 mm. after each treatment. The reductions in pulse-pressure amounted to 11 mm., 13 mm., 4 mm., 4 mm., 6 mm., 8 mm., 4 mm., 1 mm., 3 mm., 9 mm., and 10 mm. respectively; an average of 6.6 mm. for each treatment.

After the hour's rest the pulse-pressure was raised six times, lowered nine times, and no change was noted three

times. The elevations of the pulse-pressure above that recorded before the bath was given amounted to 2 mm., 10 mm., 1 mm., 1 mm., 4 mm., and 7 mm. respectively; an average elevation of 4.1 mm. at each treatment.

The reductions in pulse-pressure after the hour's rest amounted to 2 mm., 5 mm., 2 mm., 7 mm., 5 mm., 10 mm.,

TABLE III.—MITRAL REGURGITATION WITH BEGINNING LOSS OF COMPENSATION. *Blood-pressure Observations.*

No. of bath	BEFORE				AFTER			
	Systolic	Diastolic	Mean	Pulse-pressure	Systolic	Diastolic	Mean	Pulse-pressure
1	140	90	115	50	178	140	159	38
2	164	82	123	82	130	72	101	58
3	130	96	113	34	138	88	113	50
4	133	73	103	60	136	65	100.5	71
5	142	83	112.5	59	130	66	98	64
6	136	69	102.5	67	134	71	102.5	63
7	129	69	99	60	132	74	103	58
8	130	66	98	64	134	70	102	64
9	Observations missed							
10	124	69	96.5	55	124	66	95	58
11	128	68	98	60	128	65	96.5	63
12	Observations missed							
13	144	79	111.5	65	138	70	104	68
14	132	58	95	74	138	64	101	74
15	Observations missed							
16								
17	138	80	109	58	128	68	98	60
18	146	76	111	70	140	84	112	56

6 mm., 18 mm., and 6 mm. respectively; an average of 6.7 mm. after each treatment.

In the case of a female, aged 20 (Case 3), who was suffering from mitral regurgitation with beginning loss of compensation, observations were made before the baths and immediately after the baths (Table III). The observations in connection with the ninth, twelfth, fifteenth, and sixteenth baths were missed.

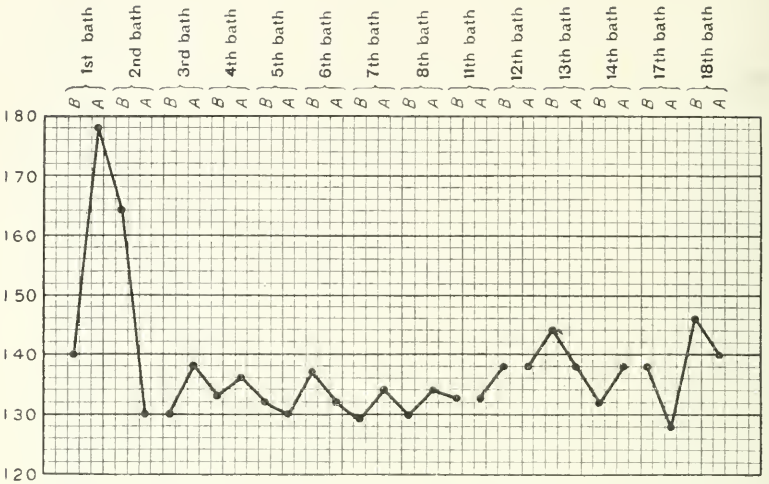

CHART 5.—Systolic blood-pressure. Carbonated brine baths. Mitral regurgitation with beginning loss of compensation. B = Immediately before the bath. A = Immediately after the bath. Observations at 9th and 10th baths missed. Observations at 15th and 16th baths missed.

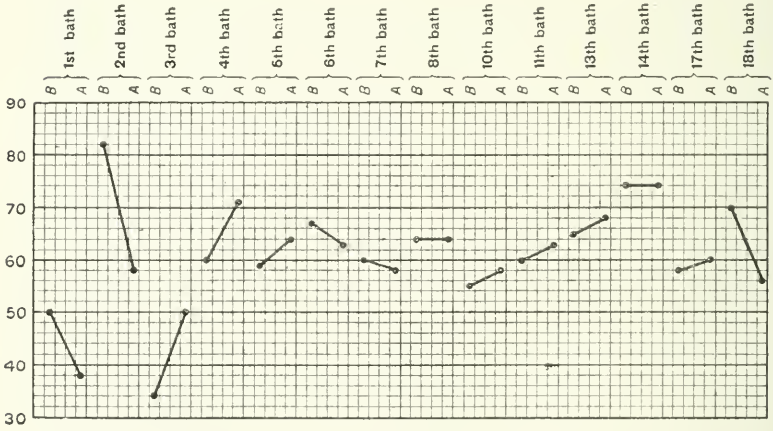

CHART 6.—Pulse-pressures. Mitral regurgitation with beginning loss of compensation. Carbonated brine baths. B = Before the bath. A = After the bath.

Immediately after the first bath there was an increase of 38 mm. in the systolic pressure. The systolic pressure (Chart 5) was increased six times, reduced six times, and was unchanged twice. The increases of systolic pressure amounted to 38 mm., 8 mm., 3 mm., 3 mm., 4 mm., and 6 mm. respectively; an average increase of 10.3 mm. at each bath. The reductions of systolic pressure amounted to 34 mm., 12 mm., 2 mm., 6 mm., 10 mm., and 6 mm. respectively; an average decrease of 11.6 mm. at each bath.

The pulse-pressure (Chart 6) was raised seven times, lowered five times, and no change was observed twice. The elevations of pulse-pressure amounted to 16 mm., 11 mm., 5 mm., 3 mm., 3 mm., 3 mm., and 2 mm. respectively; an average elevation of 6.1 mm. at each treatment.

The reductions of the pulse-pressure amounted to 12 mm., 24 mm., 4 mm., 2 mm., and 14 mm. respectively; an average reduction of 11.2 mm. after each treatment.

In the case of a male, aged 52 (Case 9), who was suffering from tachycardia, observations of systolic pressure (Chart 7) were made before and after the baths from the sixth to the seventeenth bath inclusive.

SYSTOLIC PRESSURE.

No. of bath	Before	After
6	118	140
7	98	110
8	126	130
9	150	124
10	136	136
11	158	130
12	148	150
13	120	150
14	120	132
15	128	130
16	128	136
17	120	140

The systolic pressure was increased nine times, reduced twice, and was unchanged once. The increases of systolic pressure amounted to 22 mm., 12 mm., 4 mm., 2 mm.,

30 mm., 12 mm., 2 mm., 8 mm., and 20 mm. respectively; an average of 12.4 mm. at each treatment.

The decreases of systolic pressure amounted to 26 mm. and 28 mm. respectively; an average reduction of 27 mm. at each treatment.

In the case of a female, aged 57 (Case 30), who was

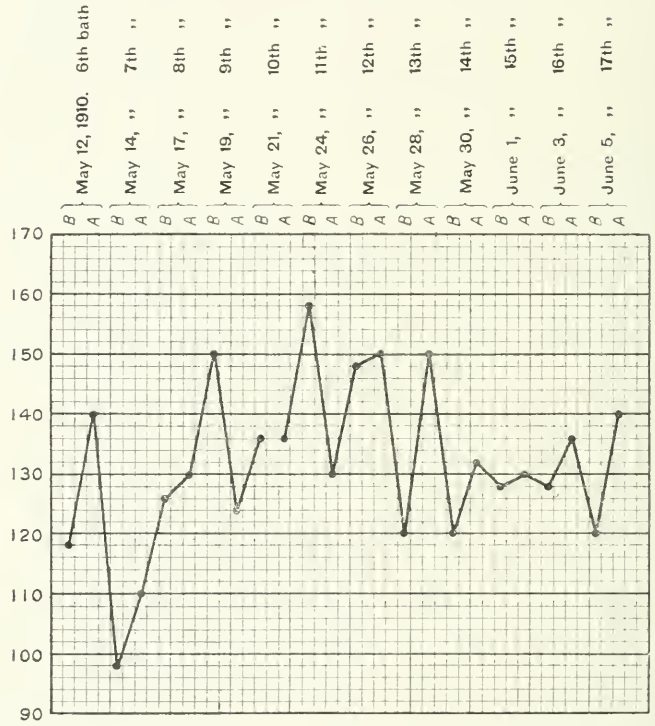

CHART 7.—Systolic pressure. Tachycardia. Carbonated brine baths. B = Before the bath. A = After the bath.

suffering from fibroid myocarditis, observations of blood-pressure were made before and after each bath for five baths. The blood-pressure observations made the patient excessivly nervous, and it was necessary to discontinue them after the fifth bath.

No. of bath	Before				After			
	Systolic	Diastolic	Mean	Pulse-pressure	Systolic	Diastolic	Mean	Pulse-pressure
1	180	130	155	50	210	170	190	40
2	170	150	160	20	184	132	158	52
3	180	118	149	62	214	152	183	62
4	186	132	159	54	164	120	142	44
5	202	150	176	52	176	118	147	58

The systolic pressure (Chart 8) was raised three times and lowered twice. The elevations in systolic pressure were 30 mm., 14 mm., and 34 mm. respectively; an average of

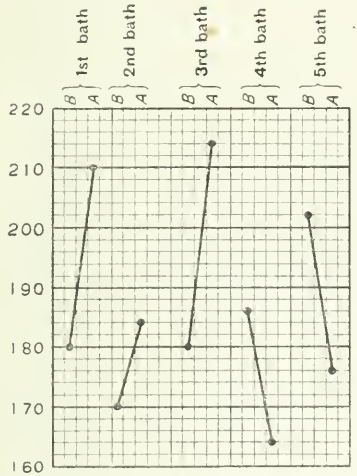

CHART 8. — Systolic pressures. Fibroid myocarditis. Carbonated brine baths. B = Before the bath. A = Immediately after the bath.

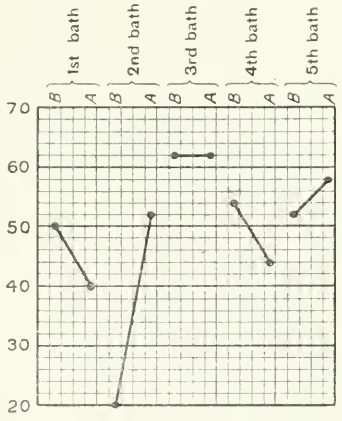

CHART 9. — Pulse-pressures. Fibroid myocarditis. Carbonated brine baths. B = Before the bath. A = Immediately after the bath.

26 mm. at each bath. The reductions in systolic pressure were 22 mm. and 26 mm. respectively; an average of 24 mm. at each treatment.

The pulse-pressure (Chart 9) was increased twice, reduced

twice, and was unchanged once. The increases were 32 mm. and 6 mm. respectively; an average of 19 mm. at each treatment. The reductions were 10 mm. and 10 mm. respectively; an average of 10 mm. at each treatment.

The study of these five cases, two of fibroid myocarditis, one of parenchymatous myocarditis, one of mitral regurgitation with beginning loss of compensation, and one of tachycardia, shows that of sixty-six observations made immediately after the administration of the baths the systolic pressure was elevated forty-three times, lowered eighteen times, and was unchanged five times. The pulse-pressure was elevated twenty-eight times, lowered twenty-one times, and was unchanged five times out of the same number of observations. The highest elevation of systolic pressure recorded was 38 mm. after the first bath in Case 3. The highest elevation of pulse-pressure recorded was 32 mm. after the first bath in Case 30.

Thirty-four observations were made of systolic pressure and pulse-pressure one hour after the baths were given. The systolic pressure was higher than before the bath was given twenty times, lower twelve times, and was unchanged twice. The greatest increase was 19 mm. after the eighteenth bath in Case 1.

The pulse-pressure was raised fourteen times, lowered sixteen times, and was unchanged four times. The highest elevation of pulse-pressure was 28 mm. after the eleventh bath in Case 1.

In these cases we probably get some idea of the effect of the treatment by baths on the blood-pressure. The majority of the observations, however, have had to be made by taking the blood-pressure at the beginning of the treatment and at its close. It must be borne in mind that nearly all the patients were receiving other forms of treatment as well as carbonated brine baths. Case 12 received electric light baths

alternating with the carbonated brine baths. Cases 8, 13, 38, 66, and 78 received carbonated brine baths on one day and resistance exercises on the alternate day. Case 15 had a carbonated brine bath on one day and a Russian bath on the alternate day. Cases 74 and 75 (the same patient) had hot brine baths, massage, and various forms of electricity. Cases 63, 64, and 65 (the same patient) had abdominal massage and colonic irrigations in addition to the carbonated brine baths.

All of the patients were in a restful environment, except for inherent restlessness and dissatisfaction on the part of some of them; all were on a carefully regulated diet, the components of which I have already published (4, 5); and all were required to rest from one to two hours every day in addition to their time in bed at night, nine hours prescribed.

For purposes of analysis the cases may be divided in two ways; those who took the full course of treatment of six weeks, sixty; and those who for one reason or another did not complete the full number of baths, twenty-one. Second, into the high-pressure cases and the low-pressure cases.

Table IV gives the reading of the systolic pressure at the beginning and at the end of the treatment in those patients who received the full course of baths.

The pressure was higher at the close of the course than at the beginning in thirty instances, lower in twenty-five instances, and was unchanged in five instances. The greatest elevation of pressure was 50 mm. in a case of beginning interstitial nephritis; the greatest reduction 42 mm. in a case of fibroid myocarditis.

Table V gives the reading of the systolic pressure in those patients who took only partial courses. At the end of the baths the systolic pressure was found elevated nine times, lowered nine times, and unchanged three times. The greatest elevation of pressure was 22 mm. in a case of

TABLE IV.—SYSTOLIC BLOOD-PRESSURE

Complete Carbonated Brine Courses.

No.	Sex	Age	Systolic pressure at beginning of treatment	Systolic pressure at end of treatment	Difference	Diagnosis
1	M.	76	142 mm.	135 mm.	− 7 mm.	Fibroid myocarditis.
2	F.	49	158 mm.	165 mm.	+ 7 mm.	Hypertrophy of the heart (toxic).
3	F.	20	140 mm.	145 mm.	+ 5 mm.	Mitral obstruction.
4	F.	60	140 mm.	152 mm.	+12 mm.	Fibroid myocarditis.
5	M.	70	168 mm.	139 mm.	−29 mm.	Dilation of the heart.
6	F.	69	150 mm.	162 mm.	+12 mm.	Fibroid myocarditis.
7	M.	45	124 mm.	174 mm.	+50 mm.	Beginning interstitial nephritis.
8	F.	37	116 mm.	124 mm.	+ 8 mm.	Hypertropy and dilation of the heart.
10	F.	56	145 mm.	140 mm.	− 5 mm.	Neurasthenia.
11	M.	36	155 mm.	157 mm.	+ 2 mm.	Hypertrophic cirrhosis of the liver.
12	M.	53	144 mm.	128 mm.	−16 mm.	Dilation of the heart.
13	F.	70	170 mm.	170 mm.	0	Fibroid myocarditis.
14	F.	77	169 mm.	150 mm.	−19 mm.	Parenchymatous myocarditis.
15	F.	65	178 mm.	167 mm.	−11 mm.	Fibroid myocarditis, chronic bronchitis.
16	F.	26	115 mm.	118 mm.	+ 3 mm.	Parenchymatous myocarditis.
17	M.	67	130 mm.	161 mm.	+31 mm.	Chronic parenchymatous nephritis.
18	M.	68	207 mm.	190 mm.	−17 mm.	Mitral regurgitation.
20	M.	63	186 mm.	212 mm.	+26 mm.	Dilation of the heart.
22	M.	36	118 mm.	110 mm.	− 8 mm.	Mitral regurgitation, aortic regurgitation.
23	M.	67	144 mm.	140 mm.	− 4 mm.	Fibroid myocarditis.
24	M.	52	110 mm.	104 mm.	− 6 mm.	Mitral regurgitation.
26	M.	50	150 mm.	130 mm.	−20 mm.	Hypertrophy of the heart.
27	M.	45	109 mm.	117 mm.	+ 8 mm.	Parenchymatous myocarditis.
28	M.	62	135 mm.	140 mm.	+ 5 mm.	Dilation of the heart.
29	M.	47	124 mm.	116 mm.	− 8 mm.	Dilation of the heart.
30	F.	57	180 mm.	164 mm.	−16 mm.	Fibroid myocarditis.
32	M.	29	119 mm.	134 mm.	+15 mm.	Parenchymatous myocarditis.
35	M.	71	184 mm.	142 mm.	−42 mm.	Fibroid myocarditis (baths in two instalments).
40	M.	35	112 mm.	102 mm.	−10 mm.	Parenchymatous myocarditis.
42	F.	54	154 mm.	114 mm.	−40 mm.	Fibroid myocarditis.
43	F.	49	162 mm.	142 mm.	−20 mm.	Hypertrophy and dilation of the heart.
44	M.	23	120 mm.	120 mm.	0	Aortic regurgitation.
45	F.	35	120 mm.	132 mm.	+12 mm.	Convalescent from acute infection.
46	F.	60	178 mm.	200 mm.	+22 mm.	Fibroid myocarditis (same patient as No. 4).
49	F.	48	130 mm.	125 mm.	− 5 mm.	Fat heart.
50	F.	68	193 mm.	210 mm.	+17 mm.	Arteriosclerosis.
51	M.	69	140 mm.	135 mm.	− 5 mm.	Hypertrophy and dilation of the heart.
52	M.	39	108 mm.	110 mm.	+ 2 mm.	Neurasthenia.

TABLE IV.—(*continued.*)

No.	Sex	Age	Systolic pressure at beginning of treatment	Systolic pressure at end of treatment	Difference	Diagnosis
53	M.	54	107 mm.	109 mm.	+ 2 mm.	Hypochrondriasis.
54	F.	26	119 mm.	120 mm.	+ 1 mm.	*Convalescent from appendectomy.
55	F.	33	90 mm.	95 mm.	+ 5 mm.	Gastrectasia.
57	F.	47	186 mm.	173 mm.	−13 mm.	Mitral regurgitation.
58	M.	27	126 mm.	125 mm.	− 1 mm.	Nervous dyspepsia.
59	M.	57	190 mm.	193 mm.	+ 3 mm.	Mitral regurgitation.
60	M.	39	119 mm.	128 mm.	+ 9 mm.	Parenchymatous myocarditis. Infectious granuloma.
62	M.	60	126 mm.	112 mm.	−14 mm.	Parenchymatous myocarditis.
63	M.	54	150 mm.	150 mm.	0	Paroxysmal tachycardia.
65	M.	55	113 mm.	120 mm.	+ 7 mm.	Paroxysmal tachycardia (same patient as No. 63).
66	M.	60	148 mm.	138 mm.	−10 mm.	Fibroid myocarditis.
67	M.	61	144 mm.	144 mm.	0	Mitral regurgitation (same patient as No. 66)
68	F.	51	198 mm.	199 mm.	+ 1 mm.	Hypertrophy and dilation of the heart.
69	F.	52	170 mm.	170 mm.	0	Hypertrophy and dilation of the heart (same patient as No. 68).
73	F.	60	170 mm.	184 mm.	+14 mm.	Fibroid myocarditis.
74	M.	56	112 mm.	120 mm.	+ 8 mm.	Arthritis deformans with myocardial insufficiency.
75	M.	56	118 mm.	125 mm.	+ 7 mm.	Same patient as No. 74.
76	M.	71	162 mm.	168 mm.	+ 6 mm.	Dilation of the heart (same patient as No. 5).
77	F.	70	140 mm.	138 mm.	− 2 mm.	Fibroid myocarditis.
78	M.	36	116 mm.	115 mm.	− 1 mm.	Dilation of the heart (same patient as No. 25).
80	F.	54	118 mm.	122 mm.	+ 4 mm.	Dilation of the heart (same patient as No. 37).
81	F.	49	130 mm.	156 mm.	+26 mm.	Hypertrophy of the heart (same patient as No. 2) after operation.

* When the last observation was made on this patient she had just developed acute bronchitis.

tachycardia, after twelve baths. The greatest reduction 29 mm. in a case of aortic regurgitation after ten baths.

Table VI gives the effect upon the diastolic pressure in the cases that received the full course of baths. The diastolic pressure was raised in twenty-six cases, lowered in twenty-eight cases, and no change was noted in six cases. The

TABLE V.—SYSTOLIC BLOOD-PRESSURE.

Incomplete Carbonated Brine Courses.

No.	Sex	Age	Systolic pressure at beginning of treatment	Systolic pressure at end of treatment	Difference	No. of baths	Diagnosis
9	M.	52	118 mm.	140 mm.	+22 mm.	12	Tachycardia.
19	M.	57	134 mm.	134 mm.	0	6	Dilation of the heart.
21	M.	53	100 mm.	100 mm.	0	11	Fibroid myocarditis, subacute bronchitis.
25	M.	35	130 mm.	116 mm.	−14 mm.	9	Dilation of the heart.
31	F.	65	125 mm.	119 mm.	− 6 mm.	9	Weak heart muscle.
33	M.	52	188 mm.	168 mm.	−20 mm.	3	Aortic regurgitation.
34	M.	58	120 mm.	120 mm.	0	11	Fibroid myocarditis.
36	M.	72	188 mm.	199 mm.	+11 mm.	9	Fibroid myocarditis.
37	F.	53	124 mm.	115 mm.	− 9 mm.	11	Dilation of the heart.
38	F.	70	162 mm.	140 mm.	−22 mm.	11	Diabetes mellitus.
39	F.	45	185 mm.	180 mm.	− 5 mm.	9	Convalescent from operation.
41	M.	58	156 mm.	166 mm.	+10 mm.	11	Hypertrophy of the heart.
47	F.	19	109 mm.	118 mm.	+ 9 mm.	11	Convalescent from typhoid fever.
48	M.	62	105 mm.	120 mm.	+15 mm.	11	Parenchymatous myocarditis.
56	M.	38	108 mm.	120 mm.	+12 mm.	9	Parenchymatous myocarditis.
61	M.	77	149 mm.	135 mm.	−14 mm.	12	Hypertrophy of the heart.
64	M.	54	125 mm.	136 mm.	+11 mm.	13	Paroxysmal tachycardia (same patient as No. 63).
70	M.	30	174 mm.	145 mm.	−29 mm.	10	Aortic regurgitation.
71	M.	35	115 mm.	125 mm.	+10 mm.	8	Pulmonary emphysema.
72	M.	48	110 mm.	115 mm.	+ 5 mm.	7	Convalescent from influenza.
79	M.	52	137 mm.	130 mm.	− 7 mm.	5	Dilation of the heart.

TABLE VI.—DIASTOLIC BLOOD-PRESSURE.

Complete Carbonated Brine Courses.

No.	Sex	Age	Diastolic pressure at beginning of treatment.	Diastolic pressure at the end of treatment	Difference
1	M.	76	85 mm.	80 mm.	− 5 mm.
2	F.	49	108 mm.	104 mm.	− 4 mm.
3	F.	20	90 mm.	80 mm.	−10 mm.
4	F.	60	86 mm.	70 mm.	−16 mm.
5	M.	70	96 mm.	80 mm.	−16 mm.
6	F.	69	84 mm.	79 mm.	− 5 mm.
7	M.	45	90 mm.	126 mm.	+36 mm.
8	F.	37	74 mm.	74 mm.	0
10	F.	56	70 mm.	75 mm.	+ 5 mm.
11	M.	36	92 mm.	90 mm.	− 2 mm.
12	M.	53	80 mm.	75 mm.	− 5 mm.
13	F.	70	112 mm.	105 mm.	− 7 mm.
14	F.	77	94 mm.	76 mm.	−18 mm.
15	F.	65	92 mm.	100 mm.	+ 8 mm.

TABLE VI.—(*continued.*)

No.	Sex	Age	Diastolic pressure at beginning of treatment	Diastolic pressure at the end of treatment	Difference
16	F.	26	60 mm.	63 mm.	+ 3 mm.
17	M.	67	93 mm.	80 mm.	−13 mm.
18	M.	68	110 mm.	100 mm.	−10 mm.
20	M.	63	100 mm.	108 mm.	+ 8 mm.
22	M.	36	75 mm.	95 mm.	+20 mm.
23	M.	67	80 mm.	85 mm.	+ 5 mm.
24	M.	52	72 mm.	68 mm.	− 4 mm.
26	M.	50	90 mm.	83 mm.	− 7 mm.
27	M.	45	66 mm.	69 mm.	+ 3 mm.
28	M.	62	92 mm.	103 mm.	+11 mm.
29	M.	47	83 mm.	72 mm.	−11 mm.
30	F.	57	130 mm.	103 mm.	−27 mm.
32	F.	29	75 mm.	82 mm.	+ 7 mm.
35	M.	71	118 mm.	88 mm.	−30 mm.
40	M.	35	70 mm.	70 mm.	0
42	F.	54	112 mm.	76 mm.	−36 mm.
43	F.	49	112 mm.	86 mm.	−26 mm.
44	M.	23	50 mm.	36 mm.	−14 mm.
45	F.	35	82 mm.	72 mm.	−10 mm.
46	F.	60	90 mm.	80 mm.	−10 mm.
49	F.	48	78 mm.	90 mm.	+12 mm.
50	F.	68	85 mm.	79 mm.	− 6 mm.
51	M.	69	75 mm.	75 mm.	0
52	M.	39	62 mm.	76 mm.	+14 mm.
53	M.	54	60 mm.	78 mm.	+18 mm.
54	F.	26	67 mm.	80 mm.	+13 mm.*
55	F.	33	55 mm.	75 mm.	+20 mm.
57	F.	47	103 mm.	105 mm.	+ 2 mm.
58	M.	27	70 mm.	80 mm.	+10 mm.
59	M.	57	119 mm.	125 mm.	+ 6 mm.
60	M.	39	78 mm.	78 mm.	0
62	M.	60	98 mm.	75 mm.	−23 mm.
63	M.	54	93 mm.	90 mm.	− 3 mm.
65	M.	55	70 mm.	70 mm.	0
66	M.	60	76 mm.	76 mm.	0
67	M.	61	62 mm.	68 mm.	+ 6 mm.
68	F.	51	100 mm.	90 mm.	−10 mm.
69	F.	52	85 mm.	95 mm.	+10 mm.
73	F.	60	85 mm.	87 mm.	+ 2 mm.
74	M.	56	75 mm.	78 mm.	+ 3 mm.
75	M.	56	102 mm.	80 mm.	−22 mm.
76	M.	71	84 mm.	90 mm.	+ 6 mm.
77	F.	70	70 mm.	72 mm.	+ 2 mm.
78	M.	36	73 mm.	75 mm.	+ 2 mm.
80	F.	54	70 mm.	68 mm.	− 2 mm.
81	F.	49	95 mm.	125 mm.	+30 mm.

* When the last observation was made on this patient she had just developed acute bronchitis.

change in diastolic pressure did not always agree with the change in systolic pressure; when the systolic pressure was elevated the diastolic pressure may have been lowered and *vice versa*. The greatest elevation of diastolic pressure was 36 mm. in a case of beginning interstitial nephritis, Case 7. The greatest lowering of diastolic pressure was 27 mm. in a case of fibroid myocarditis, Case 30.

TABLE VII.—DIASTOLIC BLOOD-PRESSURE.

Incomplete Carbonated Brine Courses.

No.	Sex	Age	Diastolic pressure at beginning of treatment	Diastolic pressure at end of treatment	Difference	Number of baths
9	M.	52	80 mm.	100 mm.	+20 mm.	12
19	M.	57	96 mm.	100 mm.	+ 4 mm.	6
21	M.	53	62 mm.	64 mm.	+ 2 mm.	11
25	M.	35	78 mm.	80 mm.	+ 2 mm.	9
31	F.	65	81 mm.	70 mm.	−11 mm.	9
33	M.	52	78 mm.	70 mm.	− 8 mm.	3
34	M.	58	84 mm.	84 mm.	0	11
36	M.	72	100 mm.	96 mm.	− 4 mm.	9
37	F.	53	70 mm.	71 mm.	+ 1 mm.	11
38	F.	70	76 mm.	72 mm.	− 4 mm.	11
39	F.	45	95 mm.	95 mm.	0	9
41	M.	58	104 mm.	110 mm.	+ 6 mm.	11
47	F.	19	58 mm.	64 mm.	+ 6 mm.	11
48	M.	62	65 mm.	66 mm.	+ 1 mm.	11
56	M.	38	65 mm.	74 mm.	+ 9 mm.	9
61	M.	77	88 mm.	83 mm.	− 5 mm.	12
64	M.	54	82 mm.	104 mm.	+22 mm.	13
70	M.	30	90 mm.	0	−90 mm.	10
71	M.	35	80 mm.	78 mm.	− 2 mm.	8
72	M.	48	72 mm.	65 mm.	− 7 mm.	7
79	M.	52	85 mm.	86 mm.	+ 1 mm.	5

Table VII gives the details of the diastolic pressure in those patients who had only partial courses. The diastolic pressure was found elevated in eleven cases, lowered in eight cases, and was unchanged in two cases. The greatest elevation in pressure, 22 mm., was seen in a case of paroxysmal tachycardia (Case 64), after thirteen baths. The greatest

TABLE VIII.—MEAN BLOOD-PRESSURE.

Complete Carbonated Brine Courses.

No.	Sex	Age	Mean pressure at beginning of treatment	Mean pressure at end of treatment	Difference
1	M.	76	113.5 mm.	107.5 mm.	− 6 mm.
2	F.	49	133 mm.	134.5 mm.	+ 1.5 mm.
3	F.	20	115 mm.	112.5 mm.	− 3.5 mm.
4	F.	60	113 mm.	111 mm.	− 2 mm.
5	M.	70	132 mm.	109 mm.	−23 mm.
6	F.	69	117 mm.	120.5 mm.	+ 3.5 mm.
7	M.	45	107 mm.	150 mm.	+43 mm.
8	F.	37	95 mm.	99 mm.	+ 4 mm.
10	F.	56	107.5 mm.	107.5 mm.	0
11	M.	36	123.5 mm.	123.5 mm.	0
12	M.	53	112 mm.	101.5 mm.	− 10.5 mm.
13	F.	70	141 mm.	137.5 mm.	− 3.5 mm.
14	F.	77	131.5 mm.	113 mm.	−18.5 mm.
15	F.	65	135 mm.	133.5 mm.	− 1.5 mm.
16	F.	26	87.5 mm.	90.5 mm.	+ 3 mm.
17	M.	67	122.5 mm.	120.5 mm.	− 2 mm.
18	M.	68	158.5 mm.	145 mm.	−13.5 mm.
20	M.	63	143 mm.	160 mm.	+17 mm.
22	M.	36	96.5 mm.	102.5 mm.	+ 6 mm.
23	M.	67	112 mm.	112.5 mm.	+ 0.5 mm.
24	M.	52	91 mm.	86 mm.	− 5 mm.
26	M.	50	120 mm.	106.5 mm.	−13.5 mm.
27	M.	45	87.5 mm.	93 mm.	+ 5.5 mm.
28	M.	62	113.5 mm.	121.5 mm.	+ 8 mm.
29	M.	47	103.5 mm.	94 mm.	− 9.5 mm.
30	F.	57	155 mm.	133.5 mm.	−21.5 mm.
32	M.	29	97 mm.	108 mm.	+11 mm.
35	M.	71	151 mm.	115 mm.	−36 mm.
40	M.	35	91 mm.	86 mm.	− 5 mm.
42	F.	54	138 mm.	95 mm.	−43 mm.
43	F.	49	137 mm.	114 mm.	−23 mm.
44	M.	23	85 mm.	78 mm.	− 7 mm.
45	F.	35	101 mm.	102 mm.	+ 1 mm.
46	F.	60	134 mm.	140 mm.	+ 6 mm.
49	F.	48	104 mm.	107.5 mm.	+ 3.5 mm.
50	F.	68	139 mm.	144.5 mm.	+ 5.5 mm.
51	M.	69	107.5 mm.	105 mm.	− 2.5 mm.
52	M.	39	85 mm.	93 mm.	+ 8 mm.
53	M.	54	83.5 mm.	93.5 mm.	+10 mm.
54	F.	26	88 mm.	100 mm.	+12 mm.
55	F.	33	72.5 mm.	85 mm.	+12.5 mm.
57	F.	47	144.5 mm.	139 mm.	− 5.5 mm.
58	M.	27	98 mm.	102.5 mm.	+ 4.5 mm.
59	M.	57	154.5 mm.	159 mm.	+ 4.5 mm.
60	M.	39	98.5 mm.	103 mm.	+ 3.5 mm.
62	M.	60	112 mm.	93.5 mm.	−18.5 mm.
63	M.	54	121.5 mm.	120 mm.	− 1.5 mm.
65	M.	55	91.5 mm.	95 mm.	+ 3.5 mm.
66	M.	60	112 mm.	107 mm.	− 5 mm.
67	M.	61	103 mm.	106 mm.	+ 3 mm.
68	F.	51	149 mm.	144.5 mm.	− 4.5 mm.
69	F.	52	127.5 mm.	132.5 mm.	+ 5 mm.
73	F.	60	127.5 mm.	135.5 mm.	+ 8 mm.
74	M.	56	93.5 mm.	99 mm.	+ 5.5 mm.
75	M.	56	110 mm.	102.5 mm.	− 7.5 mm.
76	M.	71	123 mm.	129 mm.	+ 6 mm.
77	F.	70	105 mm.	105 mm.	0
78	M.	36	94.5 mm.	95 mm.	− 0.5 mm.
80	F.	54	94 mm.	95 mm.	+ 1 mm.
81	F.	49	112.5 mm.	140.5 mm.	+28 mm.

lowering of diastolic pressure was 90 mm., seen in a case of aortic regurgitation, after ten baths.

Table VIII gives the mean pressures at the beginning and at the end of the courses of treatment of those patients who took the full course of baths.

The pressure was higher at the end of the course than at the beginning in thirty-one cases, lower in twenty-six

TABLE IX.—MEAN BLOOD-PRESSURE.

Incomplete Carbonated Brine Courses.

No.	Sex	Age	Mean pressure at beginning of treatment	Mean pressure at end of treatment	Difference	Number of baths
9	M.	52	99 mm.	120 mm.	+21 mm.	12
19	M.	57	115 mm.	117 mm.	+ 2 mm.	6
21	M.	53	81 mm.	82 mm.	+ 1 mm.	11
25	M.	35	104 mm.	98 mm.	− 6 mm.	9
31	F.	65	103 mm.	94.5 mm.	− 8.5 mm.	9
33	M.	52	133 mm.	119 mm.	−14 mm.	3
34	M.	58	102 mm.	102 mm.	0	11
36	M.	72	144 mm.	147.5 mm.	+ 3.5 mm.	9
37	F.	53	97 mm.	93 mm.	− 4 mm.	11
38	F.	70	119 mm.	106 mm.	−13 mm.	11
39	F.	45	140 mm.	137.5 mm.	− 2.5 mm.	9
41	M.	58	130 mm.	138 mm.	+ 8 mm.	11
47	F.	19	83.5 mm.	91 mm.	+ 7.5 mm.	11
48	M.	62	85 mm.	93 mm.	+ 8 mm.	11
56	M.	38	86.5 mm.	97 mm.	+10.5 mm.	9
61	M.	77	118.5 mm.	109 mm.	− 9.5 mm.	12
64	M.	54	103.5 mm.	120 mm.	+16.5 mm.	13
70	M.	30	132 mm.	72.5 mm.	−59.5 mm.	10
71	M.	35	97.5 mm.	101.5 mm.	+ 4 mm.	8
72	M.	48	91 mm.	90 mm.	− 1 mm.	7
79	M.	52	111 mm.	108 mm.	− 3 mm.	5

cases, and no difference was noted in three cases. The greatest increase in the mean pressure at the end of the course of treatment was 43 mm., in a case of beginning interstitial nephritis (Case 7); the greatest diminution was 43 mm. in a case of fibroid myocarditis (Case 42).

Table IX gives the mean pressures at the beginning and at the end of the treatments in the patients who took

TABLE X.—PULSE-PRESSURE.

Complete Carbonated Brine Series.

No.	Sex	Age	Pulse-pressure at beginning of treatment	Pulse-pressure at end of treatment	Difference
1	M.	76	57 mm.	55 mm.	− 2 mm.
2	F.	49	50 mm.	61 mm.	+11 mm.
3	F.	20	50 mm.	65 mm.	+15 mm.
4	F.	60	54 mm.	82 mm.	+28 mm.
5	M.	70	72 mm.	59 mm.	−13 mm.
6	F.	69	66 mm.	82 mm.	+16 mm.
7	M.	45	34 mm.	48 mm.	+14 mm.
8	F.	37	42 mm.	50 mm.	+ 8 mm.
10	F.	56	75 mm.	65 mm.	−10 mm.
11	M.	36	63 mm.	67 mm.	+ 4 mm.
12	M.	53	64 mm.	53 mm.	− 9 mm.
13	F.	70	58 mm.	65 mm.	+ 7 mm.
14	F.	77	75 mm.	74 mm.	− 1 mm.
15	F.	65	86 mm.	67 mm.	−19 mm.
16	F.	26	55 mm.	55 mm.	0
17	M.	67	59 mm.	81 mm.	+22 mm.
18	M.	68	97 mm.	90 mm.	− 7 mm.
20	M.	63	86 mm.	104 mm.	+18 mm.
22	M.	36	43 mm.	15 mm.	−28 mm.
23	M.	67	64 mm.	55 mm.	− 9 mm.
24	M.	52	38 mm.	36 mm.	− 2 mm.
26	M.	50	60 mm.	47 mm.	−13 mm.
27	M.	45	43 mm.	48 mm.	− 5 mm.
28	M.	62	43 mm.	37 mm.	− 6 mm.
29	M.	47	41 mm.	44 mm.	+ 3 mm.
30	F.	57	50 mm.	61 mm.	+11 mm.
32	M.	29	44 mm.	52 mm.	+ 8 mm.
35	M.	71	66 mm.	54 mm.	−12 mm.
40	M.	35	42 mm.	32 mm.	−10 mm.
42	F.	54	32 mm.	38 mm.	+ 6 mm.
43	F.	49	50 mm.	56 mm.	+ 6 mm.
44	M.	23	70 mm.	84 mm.	+14 mm.
45	F.	35	38 mm.	50 mm.	+12 mm.
46	F.	61	88 mm.	120 mm.	+32 mm.
49	F.	48	52 mm.	35 mm.	−17 mm.
50	F.	68	108 mm.	131 mm.	+23 mm.
51	M.	69	65 mm.	60 mm.	− 5 mm.
52	M.	39	46 mm.	34 mm.	−12 mm.
53	M.	54	47 mm.	31 mm.	−16 mm.
54	F.	26	52 mm.	40 mm.	−12 mm.
55	F.	33	35 mm.	20 mm.	−15 mm.
57	F.	47	83 mm.	68 mm.	−15 mm.
58	M.	27	56 mm.	45 mm.	−11 mm.
59	M.	57	71 mm.	68 mm.	− 3 mm.
60	M.	39	41 mm.	50 mm.	+ 9 mm.
62	M.	60	28 mm.	37 mm.	+ 9 mm.
63	M.	54	57 mm.	60 mm.	+ 3 mm.
65	M.	54	43 mm.	50 mm.	+ 7 mm.
66	M.	60	72 mm.	62 mm.	−10 mm.
67	M.	61	82 mm.	76 mm.	− 6 mm.
68	F.	51	98 mm.	109 mm.	+11 mm.
69	F.	52	85 mm.	75 mm.	−10 mm.
73	F.	60	85 mm.	97 mm.	+12 mm.
74	M.	56	37 mm.	42 mm.	+ 5 mm.
75	M.	56	16 mm.	45 mm.	+29 mm.
76	M.	71	78 mm.	78 mm.	0
77	F.	70	70 mm.	66 mm.	− 4 mm.
78	M.	36	43 mm.	40 mm.	− 3 mm.
80	F.	54	48 mm.	54 mm.	+ 6 mm.
81	F.	49	35 mm.	31 mm.	− 4 mm.

only partial courses of baths. The mean pressure was elevated ten times, lowered ten times, and was unchanged once. The greatest elevation was 21 mm., in a case of tachycardia (Case 9); the greatest depression was 59 mm., in a case of aortic regurgitation (Case 70).

Table X gives the readings of the pulse-pressures before and after the courses of treatment in those who received the

TABLE XI.—PULSE-PRESSURES.

Incomplete Carbonated Brine Series.

No.	Sex	Age	Pulse-pressure before the treatment	Pulse-pressure after the treatment	Number of baths	Difference
9	M.	52	38 mm.	40 mm.	12	+ 2 mm.
19	M.	57	38 mm.	34 mm.	6	− 4 mm.
21	M.	53	38 mm.	36 mm.	11	− 2 mm.
25	M.	35	52 mm.	36 mm.	9	−16 mm.
31	F.	65	44 mm.	49 mm.	9	+ 5 mm.
33	M.	52	110 mm.	98 mm.	3	−12 mm.
34	M.	58	36 mm.	36 mm.	11	0
36	M.	72	88 mm.	103 mm.	9	+15 mm.
37	F.	53	54 mm.	44 mm.	11	−10 mm.
38	F.	70	86 mm.	68 mm.	11	−18 mm.
39	F.	45	90 mm.	85 mm.	9	− 5 mm.
41	M.	58	52 mm.	56 mm.	11	+ 4 mm.
47	F.	19	51 mm.	54 mm.	11	+ 3 mm.
48	M.	62	40 mm.	54 mm.	11	+14 mm.
56	M.	38	43 mm.	46 mm.	9	+ 3 mm.
61	M.	77	61 mm.	52 mm.	12	− 9 mm.
64	M.	54	43 mm.	32 mm.	13	−11 mm.
70	M.	30	84 mm.	145 mm.	10	+61 mm.
71	M.	35	25 mm.	47 mm.	8	+22 mm.
72	M.	48	38 mm.	50 mm.	7	+12 mm.
79	M.	52	52 mm.	44 mm.	5	− 8 mm.

full number of baths. The pulse-pressure was increased in twenty-eight cases, decreased in twenty-nine cases, and was unchanged in three cases. The greatest increase of pulse-pressure was 32 mm. in a case of fibroid myocarditis (Case 46). The greatest diminution of pulse-pressure was 28 mm. in a case of mitral regurgitation and aortic regurgitation (Case 23).

Table XI gives the readings of the pulse-pressures before and after the course of baths in those who had only a part of the regular course of treatment. The pulse-pressure was raised in ten cases, lowered in ten cases, and was unchanged in one case. The greatest elevation of pulse-pressure was 61 mm. in a case of aortic regurgitation (Case 70); the greatest diminution of pulse-pressure was 18 mm. in a case of diabetes mellitus with weak heart muscle (Case 38).

As the result of the study of 1,000 cases of application for life insurance, Woley [6] has shown that the average blood-pressure of males at all ages is 127.5 mm. and of females 120 mm. His figures show an increase in the average blood-pressure in each decennial period, so that in the sixth decennium the average high pressure is 149 mm., and the average systolic pressure of all applicants in the decennium is 132 mm.

Suppose then, disregarding the ages of the patients, we classify all the cases in this study that give a blood-pressure of over 150 mm. high pressure cases. Cases 2, 5, 6, 11, 13, 14, 15, 18, 20, 30, 33, 35, 36, 38, 39, 41, 42, 43, 46, 50, 57, 59, 68, 69, 70, 73, 76, belong to this class.

Table XII gives the details of the variations of pressure in these cases. It will be seen that the systolic pressure was raised in twelve cases, lowered in thirteen cases, and was unchanged in two cases. The greatest elevation was 26 mm. in a case of dilation of the heart (Case 20). The systolic pressure was raised from 186 mm. before the treatments were begun, to 212 mm. at their conclusion.

The greatest lowering of systolic pressure was 42 mm. in a case of fibroid myocarditis (Case 35). In this case the systolic pressure was 184 mm. at the beginning of the course of treatment, and 142 mm. at its close. In this case the patient had an intermission of seven weeks in his treatment after his fifth bath. At that time his systolic pressure had

been reduced from 184 mm. to 168 mm., 16 mm. Upon resuming his treatment the systolic pressure had further fallen to 150 mm., 18 mm., in spite of the fact that he had been attending to his business. If we exclude this case, the greatest lowering of systolic pressure was 40 mm. in a case of fibroid myocarditis (Case 42).

TABLE XII.—HIGH-PRESSURE CASES.

Systolic Pressure above 150 *mm.*

No. of case	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
2	+ 7 mm.	− 4 mm.	+ 1.5 mm.	+11 mm.	18
5	−29 mm.	−16 mm.	+22.5 mm.	−13 mm.	18
6	+12 mm.	− 5 mm.	+ 3.5 mm.	+16 mm.	18
11	+ 2 mm.	− 2 mm.	0	+ 4 mm.	18
13	0	− 7 mm.	− 3.5 mm.	+ 7 mm.	18
14	−19 mm.	−18 mm.	−18.5 mm.	− 1 mm.	18
15	−11 mm.	+ 8 mm.	− 1.5 mm.	−19 mm.	18
18	−17 mm.	−10 mm.	−13.5 mm.	− 7 mm.	18
20	+26 mm.	+ 8 mm.	+17 mm.	+18 mm.	18
30	−16 mm.	−27 mm.	−21.6 mm.	+11 mm.	18
33	−20 mm.	− 8 mm.	−14 mm.	−12 mm.	3
35	−42 mm.	−30 mm.	−36 mm.	−12 mm.	18
36	+11 mm.	− 4 mm.	+ 3.5 mm.	+15 mm.	9
38	−22 mm.	− 4 mm.	−13 mm.	−18 mm.	11
39	− 5 mm.	0	− 2.5 mm.	− 5 mm.	9
41	+10 mm.	+ 6 mm.	+ 8 mm.	+ 4 mm.	11
42	−40 mm.	−36 mm.	−43 mm.	+ 6 mm.	18
43	−20 mm.	−26 mm.	−23 mm.	+ 6 mm.	18
46	+22 mm.	−10 mm.	+ 6 mm.	+32 mm.	18
50	+17 mm.	− 6 mm.	+ 5.5 mm.	+23 mm.	18
57	−13 mm.	+ 2 mm.	− 5.5 mm.	−15 mm.	18
59	+ 3 mm.	+ 6 mm.	+ 4.5 mm.	− 3 mm.	18
68	+ 1 mm.	−10 mm.	− 4.5 mm.	+11 mm.	18
69	0	+10 mm.	+ 5 mm.	−10 mm.	18
70	−29 mm.	−90 mm.	−59.5 mm.	+61 mm.	10
73	+14 mm.	+ 2 mm.	+ 8 mm.	+12 mm.	18
76	+ 6 mm.	+ 6 mm.	+ 6 mm.	0	18

The diastolic pressure was raised in eight cases, lowered in eighteen cases, and was unchanged in one case. The greatest elevation was 8 mm. in two cases; one of fibroid myocarditis with chronic bronchitis (Case 15), and one of dilation of the heart (Case 20). In the former the diastolic

pressure was 92 mm. at the beginning of the treatments, and 100 mm. at the end; in the latter the diastolic pressure rose from 100 mm. at the beginning of the treatments, to 108 mm. at their close.

The greatest reduction of diastolic pressure was 90 mm. in a case of aortic regurgitation (Case 70) after ten treatments. In a case of hypertrophy and dilation of the heart (Case 43) the diastolic pressure was reduced 26 mm.; from 112 mm. at the beginning of the treatments to 86 mm. at their close. In a case of myocarditis (Case 42) the diastolic pressure was reduced 36 mm.; from 112 mm. at the beginning of the baths to 76 mm. at the end.

The mean pressure in these cases was raised eleven times, lowered fifteen times, and was unchanged once. The greatest elevation of the mean pressure was 17 mm. in a case of dilation of the heart (Case 20). The greatest reduction of mean pressure was 59.5 mm. in a case of aortic regurgitation (Case 70).

The pulse-pressure in these cases was raised fifteen times, reduced eleven times, and was unchanged once. The greatest elevation of pulse-pressure was 61 mm. in a case of aortic regurgitation (Case 70). The greatest reduction of pulse-pressure was 19 mm. in a case of fibroid myocarditis with chronic bronchitis (Case 15).

Case 70 was a case of aortic regurgitation in a young man, aged 30. On admission he had dilation of the heart as well as hypertrophy, and the murmur of mitral regurgitation as well as a double aortic murmur. The aortic diastolic murmur, however, was not loud, and was not well transmitted. His blood-pressure showed a well marked fifth phase at 90 mm., giving him a pulse-pressure of 84 mm.

After ten carbonated brine baths, which were given in groups of three baths with an interval of one day between each group of baths, the transverse diameter of his cardiac

dulness was found to be $3\frac{3}{4}$ in. instead of $5\frac{3}{4}$ in. which was the record on admission. The point of maximum intensity of the cardiac impulse had moved in from $5\frac{3}{4}$ in. to the left of the mid-sternal line in the sixth interspace, to the mid-clavicular line in the sixth interspace. The murmur of mitral regurgitation, although still present, was not as loud as it had been and was not transmitted to the angle of the scapula. The murmur of aortic regurgitation was still present. The pulse was more positively of the Corrigan type. The blood-pressure observations gave a systolic reading of 145 mm.; but there were no phases. The tap could be heard with no pressure in the cuff. Consequently, the diastolic pressure could be considered 0, the mean pressure 72.5, and the pulse-pressure 145. Gittings [7], and Goodman and Howell [8 and 9] have pointed out the absence of phases and a diastolic pressure of 0 in cases of aortic regurgitation.

Cases 1, 3, 4, 7, 8, 9, 10, 12, 16, 17, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 34, 37, 40, 44, 45, 47, 48, 49, 51, 52, 53, 54, 55, 56, 58, 60, 61, 62, 63, 64, 65, 66, 67, 71, 72, 74, 75, 77, 78, 79, 80, and 81 may be looked upon as low-pressure cases (Table XIII). In these the systolic pressure was raised in twenty-seven cases, reduced in twenty-one cases, and was unchanged in six cases. The greatest increase in systolic pressure was 50 mm., in a case of beginning interstitial nephritis (Case 7). The patient had a systolic pressure of 124 mm., at the beginning of the treatments, and at the end of the course his systolic pressure had increased to 174 mm.

The greatest reduction of systolic pressure was 20 mm., in a case of hypertrophy of the heart (Case 26). The systolic pressure was 150 mm. at the beginning of the treatments, and 130 at the end.

The diastolic pressure was increased in twenty-nine cases,

TABLE XIII.—LOW PRESSURE CASES.

Systolic Pressure 150 *mm., or below.*

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
1	− 7 mm.	− 5 mm.	− 6 mm.	− 2 mm.	18
3	+ 5 mm.	−10 mm.	− 3.5 mm.	+15 mm.	18
4	+12 mm.	−16 mm.	− 2 mm.	+28 mm.	18
7	+50 mm.	+36 mm.	+43 mm.	+14 mm.	18
8	+ 8 mm.	0	+ 4 mm.	+ 8 mm.	18
9	+22 mm.	+20 mm.	+21 mm.	+ 2 mm.	12
10	− 5 mm.	+ 5 mm.	0	−10 mm.	18
12	−16 mm.	− 5 mm.	−10.5 mm.	− 9 mm.	18
16	+ 3 mm.	+ 3 mm.	+ 3 mm.	0	18
17	+ 9 mm.	−13 mm.	− 2 mm.	+22 mm.	18
19	0	+ 4 mm.	− 2 mm.	− 4 mm.	6
21	0	+ 2 mm.	+ 1 mm.	− 2 mm.	11
22	− 8 mm.	+20 mm.	+ 6 mm.	−28 mm.	18
23	− 4 mm.	+ 5 mm.	+ 0.5 mm.	− 9 mm.	18
24	− 6 mm.	− 4 mm.	− 5 mm.	− 2 mm.	18
25	−14 mm.	+ 2 mm.	− 6 mm.	−16 mm.	9
26	−20 mm.	− 7 mm.	−13.5 mm.	−13 mm.	18
27	+ 8 mm.	+ 3 mm.	+ 5.5 mm.	− 5 mm.	18
28	+ 5 mm.	+11 mm.	+ 8 mm.	− 6 mm.	18
29	− 8 mm.	−11 mm.	− 9.5 mm.	− 3 mm.	18
31	− 6 mm.	−11 mm.	− 8.5 mm.	+ 5 mm.	9
32	+15 mm.	+ 7 mm.	+11 mm.	+ 8 mm.	18
34	0	0	0	0	11
37	− 9 mm.	+ 1 mm.	− 4 mm.	−10 mm.	11
40	−10 mm.	0	− 5 mm.	−10 mm.	18
44	0	−14 mm.	− 7 mm.	+14 mm.	18
45	+12 mm.	−10 mm.	− 1 mm.	+12 mm.	18
47	+ 9 mm.	+ 6 mm.	+ 7.5 mm.	+ 3 mm.	11
48	+15 mm.	+ 1 mm.	+ 8 mm.	+14 mm.	11
49	− 5 mm.	+12 mm.	+ 3.5 mm.	−17 mm.	18
51	− 5 mm.	0	− 2.5 mm.	− 5 mm.	18
52	+ 2 mm.	+14 mm.	+ 8 mm.	−12 mm.	18
53	+ 2 mm.	+18 mm.	+10 mm.	−16 mm.	18
54	+ 1 mm.	+13 mm.	+ 7 mm.	−12 mm.	18
55	+ 5 mm.	+20 mm.	+12.5 mm.	−15 mm.	18
56	+12 mm.	+ 9 mm.	+10.5 mm.	+ 3 mm.	9
58	− 1 mm.	+10 mm.	+ 4.5 mm.	−11 mm.	18
60	+ 9 mm.	0	+ 4.5 mm.	+ 9 mm.	18
61	−14 mm.	− 5 mm.	− 9.5 mm.	− 9 mm.	12
62	−14 mm.	−23 mm.	−18.5 mm.	+ 9 mm.	18
63	0	− 3 mm.	− 1.5 mm.	+ 3 mm.	18
64	+11 mm.	+22 mm.	+16.5 mm.	+11 mm.	13
65	+ 7 mm.	0	+ 3.5 mm.	+ 7 mm.	18
66	−10 mm.	0	− 5 mm.	−10 mm.	18
67	0	+ 6 mm.	+ 3 mm.	− 6 mm.	18
71	+10 mm.	− 2 mm.	+ 4 mm.	+22 mm.	8
72	+ 5 mm.	− 7 mm.	− 1 mm.	+12 mm.	7
74	+ 8 mm.	+ 3 mm.	+ 5.5 mm.	+ 5 mm.	18
75	+ 7 mm.	−22 mm.	− 7.5 mm.	+29 mm.	18
77	− 2 mm.	+ 2 mm.	0	− 4 mm.	18
78	− 1 mm.	+ 2 mm.	+ 0.5 mm.	− 3 mm.	18
79	− 7 mm.	+ 1 mm.	− 3 mm.	− 8 mm.	5
80	+ 4 mm.	− 2 mm.	+ 1 mm.	+ 6 mm.	18
81	+26 mm.	+31 mm.	+28 mm.	− 4 mm.	18

reduced in eighteen cases, and was unchanged in seven cases. The greatest elevation of diastolic pressure was 36 mm., in a case of beginning interstitial nephritis (Case 7). The patient had a diastolic pressure of 90 mm. at the beginning of the treatments, and 126 mm. at their close. The greatest reduction of diastolic pressure was 23 mm., in a case of parenchymatous myocarditis (Case 62). At the beginning of the treatments the diastolic pressure was 98 mm., and at their close it was 75 mm. This patient was 60 years of age.

The mean pressure was elevated in thirty cases, reduced in twenty-one cases, and was unchanged in three cases. The greatest increase in mean pressure was 43 mm., in a case of beginning interstitial nephritis (Case 7). The greatest decrease in mean pressure was 18.5 mm., in a case of parenchymatous myocarditis (Case 62).

The pulse-pressure was elevated in twenty-two cases, reduced in thirty cases, and was unchanged in two cases. The greatest elevation of pulse-pressure was 29 mm., in a case of arthritis deformans with myocardial insufficiency (Case 75). The greatest reduction in pulse-pressure was 28 mm., in a case of mitral regurgitation and aortic regurgitation (Case 22).

Fibroid Myocarditis.—Cases 1, 4, 6, 13, 15, 21, 23, 30, 34, 35, 36, 42, 46, 66, 73, and 77 are cases of fibroid myocarditis.

In these cases the systolic pressure was raised in five, reduced in eight, and no change was noted in three. The greatest elevation of systolic pressure was 22 mm., in Case 46; the greatest reduction was 42 mm., in Case 35.

The diastolic pressure was raised in five cases, reduced in nine cases, and was unchanged in two cases. The greatest elevation was 8 mm., in Case 15; the greatest reduction 30 mm., in Case 35.

The mean pressure was raised in six cases, lowered in eight cases, and was unchanged in two cases. The greatest elevation of mean pressure was 8 mm., in Case 73; the greatest reduction was 43 mm., in Case 42.

The pulse-pressure was increased in eight cases, reduced in seven cases, and was unchanged in one case. The greatest elevation of pulse-pressure was 32 mm., in Case 46; the greatest reduction was 19 mm., in Case 15.

TABLE XIV.—CASES OF FIBROID MYOCARDITIS.

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
1	− 7 mm.	− 5 mm.	− 6 mm.	− 2 mm.	18
4	+12 mm.	−16 mm.	− 2 mm.	+28 mm.	18
6	+12 mm.	− 5 mm.	+ 3.5 mm.	+16 mm.	18
13	0	− 7 mm.	− 3.5 mm.	+ 7 mm.	18
15	−11 mm.	8 mm.	− 1.5 mm.	−19 mm.	18
21	0	2 mm.	1 mm.	− 2 mm.	11
23	− 4 mm.	5 mm.	0.5 mm.	− 9 mm.	18
30	−16 mm.	−27 mm.	−21.5 mm.	+11 mm.	18
34	0	0	0	0	11
35	−42 mm.	−30 mm.	−36 mm.	−12 mm.	18
36	+11 mm.	− 4 mm.	+ 3.5 mm.	+15 mm.	9
42	−40 mm.	−46 mm.	−43 mm.	+ 6 mm.	18
46	+22 mm.	−10 mm.	+ 6 mm.	+32 mm.	18
66	−10 mm.	0	− 5 mm.	−10 mm.	18
73	+14 mm.	+ 2 mm.	+ 8 mm.	+12 mm.	18
77	− 2 mm.	+ 2 mm.	0	− 4 mm.	18

Parenchymatous Myocarditis.—Cases 14, 16, 27, 32, 40, 48, 56, 60, and 62 are cases of parenchymatous myocarditis.

The systolic pressure was raised in six of these cases and was reduced in three. The greatest elevation of systolic pressure was 15 mm., in Cases 32 and 48; the greatest reduction was 19 mm., in Case 14.

The diastolic pressure was raised in five cases, lowered in two cases, and was unchanged in two cases. The greatest elevation was 9 mm., in Case 56; the greatest reduction was 23 mm., in Case 62.

The mean pressure was raised in six cases and lowered in three cases. The greatest elevation was 11 mm., in Case 32; the greatest reduction was 18.5 mm., in Cases 14 and 62.

The pulse-pressure was increased in five cases, reduced in three cases, and was unchanged in one case. The greatest elevation of pulse-pressure was 14 mm., in Case 48; the greatest reduction was 10 mm., in Case 40.

TABLE XV.—CASES OF PARENCHYMATOUS MYOCARDITIS.

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
14	−19 mm.	−18 mm.	−18.5 mm.	− 1 mm.	18
16	+ 3 mm.	+ 3 mm.	+ 3 mm.	0	18
27	+ 8 mm.	+ 3 mm.	+ 5.5 mm.	− 5 mm.	18
32	+15 mm.	+ 7 mm.	+11 mm.	+ 8 mm.	18
40	−10 mm.	0	− 5 mm.	−10 mm.	18
60	+ 9 mm.	0	+ 4.5 mm.	+ 9 mm.	18
62	−14 mm.	−23 mm.	−18.5 mm.	+ 9 mm.	18
48	+15 mm.	+ 1 mm.	+ 8 mm.	+14 mm.	11
56	+12 mm.	+ 9 mm.	+10.5 mm.	+ 3 mm.	9

Dilation of the Heart.—Cases 5, 12, 19, 20, 25, 28, 29, 76, 78, 79, and 80 are cases of dilation of the heart.

In four of these cases the systolic pressure was raised, in six it was lowered, and in one no change was noted. The greatest elevation of systolic pressure was 26 mm., in Case 20; the greatest depression was 29 mm., in Case 5.

The diastolic pressure was raised in seven cases and lowered in four. The greatest elevation of diastolic pressure was 11 mm., in Case 28; the greatest reduction was 16 mm., in Case 5.

The mean pressure was raised in six cases and lowered in five cases. The greatest elevation was 17 mm., in Case 20; the greatest reduction was 22.5 mm., in Case 5.

The pulse-pressure was raised in two cases, lowered in

eight cases, and no change was noted in one case. The greatest increase in pulse-pressure was 18 mm., in Case 20; the greatest decrease was 16 mm., in Case 25.

TABLE XVI.—CASES OF DILATION OF THE HEART.

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
5	−29 mm.	−16 mm.	−22.5 mm.	−13 mm.	18
12	−16 mm.	− 5 mm.	−10.5 mm.	− 9 mm.	18
19	0	+ 4 mm.	+ 2 mm.	− 4 mm.	6
20	+20 mm.	+ 8 mm.	+17 mm.	+18 mm.	18
25	−14 mm.	+ 2 mm.	− 6 mm.	−16 mm.	9
28	+ 5 mm.	+11 mm.	+ 8 mm.	− 6 mm.	18
29	− 8 mm.	−11 mm.	− 9.5 mm.	− 3 mm.	18
76	+ 6 mm.	+ 6 mm.	+ 6 mm.	0	18
78	− 1 mm.	+ 2 mm.	+ 0.5 mm.	− 3 mm.	18
79	+ 7 mm.	+ 1 mm.	− 3 mm.	− 8 mm.	5
80	+ 4 mm.	− 2 mm.	+ 1 mm.	+ 6 mm.	18

Hypertrophy and Dilation of the Heart.—Cases 8, 43, 51, 68, and 69 are cases of hypertrophy and dilation of the heart.

The systolic pressure in these cases was raised twice, lowered twice, and no change was observed once. The

TABLE 17.—CASES OF HYPERTROPHY AND DILATION OF THE HEART.

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
8	+ 8 mm.	0	+ 4 mm.	+ 8 mm.	18
43	−20 mm.	−36 mm.	−23 mm.	+ 6 mm.	18
51	− 5 mm.	0	− 2.5 mm.	− 5 mm.	18
68	+ 1 mm.	−10 mm.	− 4.5 mm.	+11 mm.	18
69	0	+10 mm.	+ 5 mm.	−10 mm.	18

greatest increase in systolic pressure was 8 mm., in Case 8; the greatest decrease of systolic pressure was 20 mm., in Case 43.

The diastolic pressure was raised once, lowered twice,

and no change was noted twice. The elevation amounted to 10 mm., in Case 69. The greatest reduction of diastolic pressure was 36 mm., in Case 43.

The mean pressure was raised twice, and lowered three times. The greatest elevation of mean pressure was 5 mm., in Case 69; the greatest reduction was 23 mm., in Case 43.

The pulse-pressure was raised three times and lowered twice. The greatest elevation of pulse-pressure was 11 mm., in Case 68; the greatest decrease in pulse-pressure was 10 mm., in Case 69.

Mitral Regurgitation.—Cases 18, 24, 57, 59, and 67 are cases of mitral regurgitation. In these cases the systolic pressure was raised once, reduced three times, and no change was observed once. The increase of systolic pressure amounted to 3 mm., in Case 59. The greatest reduction of systolic pressure amounted to 17 mm., in Case 18.

The diastolic pressure was raised in three cases and was reduced in two cases. The greatest increase of diastolic pressure was 6 mm., in Cases 59 and 67. The greatest reduction of diastolic pressure was 10 mm., in Case 18.

The mean pressure was raised twice and lowered three times. The greatest increase of mean pressure was 4.5 mm., in Case 59. The greatest decrease of mean pressure was 13.5 mm., in Case 18.

Pulse-pressure was reduced in every case; the greatest reduction was 15 mm., in Case 57.

TABLE XVIII.—CASES OF MITRAL REGURGITATION.

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
18	−17 mm.	−10 mm.	−13.5 mm.	− 7 mm.	18
24	− 6 mm.	− 4 mm.	− 5 mm.	− 7 mm.	18
57	−13 mm.	+ 2 mm.	− 5.5 mm.	−15 mm.	18
59	+ 3 mm.	+ 6 mm.	+ 4.5 mm.	− 3 mm.	18
67	0	+ 6 mm.	+ 3 mm.	− 6 mm.	18

Hypertrophy of the Heart.—Cases 2, 26, 41, 61, and 81 are cases of hypertrophy of the heart. In these cases the systolic pressure was increased in three and reduced in two. The greatest increase of systolic pressure was 26 mm., in Case 81. The greatest reduction in systolic pressure was 20 mm., in Case 26.

The diastolic pressure was increased in two cases and reduced in three cases. The greatest increase of diastolic pressure was 30 mm., in Case 81; the greatest reduction of diastolic pressure was 7 mm., in Case 26.

The mean pressure was increased in three cases and reduced in two. The greatest increase in mean pressure was 28 mm., in Case 81, and the greatest reduction in mean pressure was 13.5 mm., in Case 26.

The pulse-pressure was increased in two cases and reduced in three cases. The greatest increase in pulse-pressure was 11 mm., in Case 2; the greatest reduction in pulse-pressure was 13 mm., in Case 26.

TABLE XIX.—CASES OF HYPERTROPHY OF THE HEART.

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
2	+ 7 mm.	− 4 mm.	+ 1.5 mm.	+11 mm.	18
26	−20 mm.	− 7 mm.	−13.5 mm.	−13 mm.	18
41	+10 mm.	+ 6 mm.	+ 8 mm.	+ 4 mm.	11
61	−14 mm.	− 5 mm.	− 9.5 mm.	− 9 mm.	12
81	+26 mm.	+30 mm.	+28 mm.	− 4 mm.	18

Tachycardia.—Cases 9, 63, 64, and 65 are cases of tachycardia.

The systolic pressure was increased in three of these cases and no change was noted in the other one. The greatest increase of systolic pressure was 22 mm., in Case 9.

The diastolic pressure was increased in two of the cases, diminished in one, and no change was noted in the other

one. The greatest increase of diastolic pressure was 22 mm., in Case 64. The reduction of diastolic pressure was 3 mm., in Case 62.

The mean pressure was raised in three of the cases and lowered in one. The greatest elevation of mean pressure

TABLE XX.—CASES OF TACHYCARDIA.

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
9	+22 mm.	+20 mm.	+21 mm.	+ 2 mm.	12
63	0	− 3 mm.	− 1.5 mm.	+ 3 mm.	18
64	+11 mm.	+22 mm.	+16.5 mm.	−11 mm.	13
65	+ 7 mm.	0	+ 3.5 mm.	+ 7 mm.	18

was 21 mm., in Case 9. The reduction of mean pressure was 1.5 mm., in Case 63.

The pulse-pressure was increased in three of the cases and reduced in the other one. The greatest increase of pulse-pressure was 7 mm., in Case 65; the reduction of pulse-pressure was 11 mm., in Case 64.

Aortic Regurgitation.—Cases 33, 44, and 70 are cases of aortic regurgitation.

The systolic pressure was diminished in two of these cases and no change was noted in the other one. The greatest reduction of pressure was 29 mm., in Case 70.

The diastolic pressure was reduced in all three cases. The greatest reduction was 90 mm., in Case 70.

TABLE XXI.—CASES OF AORTIC REGURGITATION.

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
33	−20 mm.	− 8 mm.	−14 mm.	−12 mm.	3
44	0	−14 mm.	− 7 mm.	+14 mm.	18
70	−29 mm.	−90 mm.	−59.5 mm.	+61 mm.	10

The mean pressure was reduced in all three of the cases. The greatest reduction was 59.5 mm., in Case 70.

The pulse-pressure was increased in two of the cases and diminished in the third. The greatest increase of pulse-pressure was 61 mm., in Case 70; the diminution of pulse-pressure amounted to 12 mm., in Case 33.

Arteriosclerosis.—Cases 37 and 50 are cases of arteriosclerosis.

In one of these cases the systolic pressure was increased and in the other one it was diminished. The diastolic pressure, the mean pressure, and the pulse-pressure were increased in one case and diminished in the other.

TABLE XXII.—CASES OF ARTERIOSCLEROSIS.

No.	Variation of systolic pressure	Variation of diastolic pressure	Variation of mean pressure	Variation of pulse-pressure	Number of baths
37	− 9 mm.	+ 1 mm.	− 4 mm.	−10 mm.	11
50	+17 mm.	− 6 mm.	+ 5.5 mm.	+23 mm.	18

In the case of mitral obstruction and regurgitation (Case 3) the systolic pressure was increased; the diastolic pressure and the mean pressure were reduced; and the pulse-pressure was increased.

In the case of chronic parenchymatous nephritis (Case 17) the systolic pressure was increased; the diastolic and mean pressures were reduced; and the pulse-pressure was increased.

In the case of beginning interstitial nephritis (Case 7) the systolic pressure was increased 50 mm.; the diastolic pressure was increased 36 mm.; the mean pressure was increased 43 mm., and the pulse-pressure was increased 14 mm.

In the case of mitral regurgitation and aortic regurgita-

tion (Case 22) the systolic pressure was reduced; the diastolic and mean pressures were increased; and the pulse-pressure was reduced.

In the case of fat heart (Case 49) the systolic pressure was reduced; the diastolic pressure and the mean pressure were increased; and the pulse-pressure was reduced.

In the case of weak heart (Case 30) the systolic pressure, the diastolic pressure, and the mean pressure were reduced, but the pulse-pressure was increased.

Details of Clinical Records of Five of the Cases.

Case 1.—Male, aged 76, oil producer. October 7, 1910.

Diagnosis.—Fibroid myocarditis.

Chief Complaint.—Pseudoanginoid attacks, twenty-one years in duration.

Point of maximum impulse not obtainable.

Dulness third rib, fifth interspace, right edge of sternum, 1 in. outside the midclavicular line.

No murmurs.

Diastolic sounds not accentuated.

Muscular quality of the systolic sound markedly deficient.

Liver dulness, fourth interspace to the sixth interspace; edge palpable; not tender.

Blood-pressure, recumbent:—

Systolic	142
Diastolic	85
Mean	113.5
Pulse-pressure	57

Pulse 72, regular, good strength and volume, artery not palpable.

Course of carbonated brine baths finished, November 13, 1910.

Point of maximum impulse not obtainable. Impulse in the third interspace inside the midclavicular line.

Dulness, second interspace, fifth rib, midsternal line, just outside the midclavicular line. Transverse diameter of cardiac dulness, $5\frac{1}{2}$ in.

No murmurs.

Diastolic sounds normal.

Muscular quality of the systolic sound decidedly deficient.

Liver dulness, fourth rib to the sixth interspace; edge palpable on deep inspiration.

Blood-pressure, recumbent :—

Systolic	135
Diastolic	80
Mean	107.5
Pulse-pressure	55

Pulse 78, regular, good strength and volume; artery palpable.

Case 3.—Female, aged 20, kitchen helper. May 27, 1910.

Diagnosis.—Mitral obstruction and regurgitation.

Chief Complaints.—Chills, dyspnœa, palpitation of the heart, œdema of the feet and ankles.

Point of maximum impulse, fifth interspace, $\frac{1}{2}$ in. outside the midclavicular line.

Dulness, third rib, fifth interspace, left edge of the sternum, outside the midclavicular line.

There is a presystolic and a systolic murmur at the apex.

Muscular quality of the systolic sound fair.

Rhythm irregular, occasional dropping of a beat.

Liver dulness, sixth interspace to the eighth rib, edge not palpable.

Blood-pressure, recumbent :—

Systolic	140
Diastolic	90
Mean	115
Pulse-pressure	50

Pulse 56, occasionally drops a beat.

Course of carbonated brine baths, finished July 22, 1910.

Physical examination not made.

Blood-pressure, recumbent :—

Systolic	145
Diastolic	80
Mean	112.5
Pulse-pressure	65

Pulse 75.

Case 9.—Male, aged 52, secretary. April 28, 1910.

Diagnosis.—Tachycardia.

Chief Complaint.—Tachycardia.

No record of examination before treatment.

Blood-pressure, before the sixth bath, recumbent:—

Systolic	118
Diastolic	80
Mean	99
Pulse-pressure	38

Pulse 126.

Course of carbonated brine baths, finished June 4, 1910.

Point of maximum impulse not obtainable.

Dulness, second interspace, fifth interspace, left edge of sternum, ½ in. inside the midclavicular line.

No murmurs.

Muscular quality of the systolic sound normal.

Diastolic sounds normal.

Blood-pressure, recumbent, after the last bath:—

Systolic	140
Diastolic	100
Mean	120
Pulse-pressure	40

Pulse 130, running.

Case 16.—Female, aged 26. November 27, 1910.

Diagnosis.—Parenchymatous myocarditis.

The patient had an attack of puerperal convulsions in 1909, and a mild attack of diphtheria in November, 1910.

Chief Complaints.—Lack of ambition and tired feeling.

Point of maximum impulse, fifth interspace, inside the midclavicular line.

Dulness, third rib, fifth interspace, midsternal line, midclavicular line.

No murmurs.

Diastolic sounds normal.

Muscular quality of the systolic sound fair.

Liver dulness, fifth interspace to the eighth rib, edge not palpable, not tender.

Blood-pressure, recumbent:—

Systolic	115
Diastolic	60
Mean	87.5
Pulse-pressure	55

Pulse 74, regular, good strength and volume; artery not palpable.

Course of carbonated brine baths, finished January 21, 1911.

Point of maximum impulse, fifth interspace, inside the midclavicular line.

Dulness, third rib, fifth interspace, a little to the right of the midsternal line, inside the midclavicular line. Transverse diameter of cardiac dulness $4\frac{1}{4}$ in.

No murmurs.

Diastolic sounds normal.

Muscular quality of the systolic sound good.

Liver dulness, fifth interspace to the costal margin, edge not palpable, not tender.

Blood-pressure, recumbent :—

Systolic	118
Diastolic	63
Mean	90.5
Pulse-pressure	55

Pulse 68, regular, fair strength and volume; artery not palpable.

Urine contained a trace of albumin twice. No casts. Specific gravity, 1.010 to 1.017.

Case 30.—Female, aged 57. June 27, 1910.

Diagnosis.—Fibroid myocarditis.

Chief Complaints.—Excessive nervousness and attacks of distress in the precordium, dyspnea, numbness in the left side and left arm, and fear of impending death.

Point of maximum impulse not obtainable.

Dulness, third rib, fifth interspace, left edge of the sternum, outside the midclavicular line.

There is a soft systolic murmur, heard at the apex, transmitted as far as the anterior axillary line, not heard in the axilla or at the angle of the scapula. The murmur occupies the first part of systole.

The aortic diastolic sound is markedly accentuated.

The muscular quality of the systolic sound is good.

Liver dulness from the sixth rib to the eighth rib; edge not palpable.

Blood-pressure, recumbent :—

Systolic	180
Diastolic	130
Mean	155
Pulse-pressure	50

Pulse 72, regular, fair strength and volume; markedly

plus tension to the palpating finger; artery markedly thickened.

Course of carbonated brine baths, finished August 10, 1910.

Point of maximum impulse, fifth interspace, midclavicular line.

Dulness, fourth rib, fifth interspace, right edge of the sternum, midclavicular line.

The systolic sound at the apex is impure, but there is no definite transmission.

Aortic diastolic sound is markedly accentuated.

Muscular quality of the systolic sound good.

Liver dulness, sixth rib to the eighth rib; edge not palpable.

Blood-pressure, recumbent:—

Systolic	164
Diastolic	103
Mean	133.5
Pulse-pressure	61

Pulse 80, regular, good strength and volume; artery palpable.

Conclusions.

(1) Carbonated brine baths have no constant effect on the blood-pressure of the human subject.

(2) In the cases in which observations were made both before and after each bath the systolic pressure was raised more frequently than it was lowered; so that we may say that the tendency of the baths is to raise the blood-pressure.

(3) Although there are cases of high blood-pressure in which a course of carbonated brine baths has been followed by a lower systolic pressure; there are other cases of high pressure in which the pressure has been higher at the end of the course of treatment than it was at the beginning; in one case 26 mm. higher.

(4) Although there are cases of low blood-pressure in which a course of carbonated brine baths has been followed by a higher systolic pressure; there are other cases of low

pressure in which the pressure has been lower at the end of the course of treatment than it was at the beginning; in one case 20 mm. lower.

(5) There is no method of determining in advance whether a given treatment will be followed by an elevation or by a fall of pressure.

(6) In the eighty-one cases the systolic pressure was higher at the end of the course of treatment than at the beginning in thirty-nine; lower in thirty-four; and unchanged in eight.

(7) In cases of fibroid myocarditis the pressure effect is inconstant. In this series of cases the systolic pressure was lowered more often than it was raised; but the pulse-pressure was raised more often than it was lowered. It seems to me a dangerous procedure to use a form of treatment in a case of cardiac fibrosis which may be followed by an increase of systolic pressure of 22 mm., or an increase of pulse-pressure of 32 mm.

(8) In cases of parenchymatous myocarditis the effect of the baths on blood-pressure is usually to raise it, but in some cases the baths are followed by a reduction of both the systolic and the pulse-pressures.

(9) In cases of dilation of the heart, cases of hypertrophy and dilation of the heart, cases of mitral regurgitation, cases of hypertrophy of the heart, cases of tachycardia and cases of aortic regurgitation the same uncertainty of results was seen, except that in cases of mitral regurgitation the pulse pressure was reduced in every one of the five cases; and in cases of aortic regurgitation the diastolic pressure and the mean pressure were reduced in every one of three cases.

(10) In a case of arteriosclerosis an increase of 17 mm. in the systolic pressure and 23 mm. in pulse-pressure might result disastrously. In a case of chronic parenchymatous nephritis an increase of 9 mm. in systolic pressure and of

22 mm. in pulse-pressure may or may not be negligible. In a case of interstitial nephritis an increase of 50 mm. in systolic pressure could hardly be thought desirable.

(11) The reduction of systolic pressure in a case of weak heart can scarcely be looked upon as a favorable circumstance.

(12) The benefit in the subjective symptoms in cases of heart disease which follow a course of carbonated brine baths is not dependent on the influence of the treatment on the blood-pressure.

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THE INFLUENCE OF MENTAL ATTITUDE IN THE TREATMENT OF DISEASES OF THE ORGANS OF RESPIRATION AND CIRCULATION.

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Every physician, in his conduct towards his patient, aims to produce in him a confident expectancy towards the treatment of his disease, and a stimulating hope for a favourable outcome of the disorder. By so doing, the physician practically acknowledges that he realizes that mental attitude exercises a direct influence upon the course and ultimate outcome of the disease.

If the mental attitude exercises no such influence, why are we so careful to promote a cheerful, encouraging environment, and to avoid all depressing influences? And if a favourable mental attitude in the patient does exercise a beneficial influence, why do we not more systematically and scientifically study the process by which it may be promoted?

I maintain that psychology is as advanced, as exact, and as well understood a science as chemico-physical therapeutics, and, I believe the mind is constantly playing an active part in influencing the results in all medical treatment. If it be so, why, while we devote so much time and study to the administration of physical remedies, do we so com-

pletely ignore the scientific investigation of the phenomena of the mind?

It is a constant source of chagrin to me that for so many years I should have practised my profession, in absolute ignorance of the existence of scientific knowledge, the possession of which would have materially increased my usefulness and efficiency in the control of the diseases and disorders of my patients. I hope, however, that the day has passed, in which psychology was looked upon with distrust by the profession, and that it will be no longer ignored in our medical schools. If our medical course is too short, or too crowded, for a place to be found for practical applied medical psychology, our course is too short and too incomplete to qualify our students for the satisfactory practice of medicine.

There are principles which are too important in the part they play in the causation, course, and treatment of disease to allow their application to be longer left to intuition, to instinctive guesswork, or to uninstructed common sense. We all use, in some sort of a way, psychological methods. Why not learn to do so in the most scientific way?

Innumerable papers can be found in current medical literature written by scientific and experienced medical practitioners in all parts of the civilized world expounding the theories and giving practical results in medical psychology, so I need not here discuss the process by which, or the degree to which, the mind of the patient influences the physical conditions. I must, however, positively affirm that psycho-therapeutics is not a department of medicine interesting only to the neurologist. It is of universal application, and is consciously, or unconsciously, continually used by every practitioner in every department of medicine.

To us in this society it is of great interest, for in the conditions and disorders which we here especially discuss, it

undoubtedly plays an all important part in both causation and treatment.

In the limited time properly allowed for the reading of a paper while presenting so broad and so generally applicable a subject, one must, necessarily, be limited to a general statement of principles and theories, and then to give a few practical examples of the applications of these principles.

Psychology teaches that, and physicians are generally aware that states of mind can, by voluntary effort, be developed, which directly stimulate or inhibit the emotions. Thus, anxiety, worry, fear, despair, and all depressing ideas on the one hand; and, joy, hope, happy anticipation and confident expectancy, on the other, are conditions which can be directly influenced, and as all are aware, habitual emotional states directly influence the general mental attitude.

It is beyond question, also, that the action of many of the organs is continually changing with the altering mental states; the respiration changes, in health and in disease, as attention and expectancy vary; and the heart and arteries are undergoing constant variation in their activities as the attitude of the mind changes. Thus, we constantly see the exhilarating effects of good news, and the physical depression of grief, the blushing of shame, and the pallor of fear. These are all physical results, due, directly, to mental conditions which can be produced by volitional, as well as accidental, circumstances.

Pawlow has proved for us that the digestive secretions are directly influenced by mental states, and it is easy to demonstrate, clinically, that all other secretions and excretions are similarly affected. It is also easy to clinically show that the mucous membrane of the entire respiratory tract is influenced by the emotions and the expectancy of the patient.

If the aeration of the blood through the changes in the depth and rhythm of respiration, and the force, volume, and

rate of the blood-stream, through cardiac and arterial variations, can be modified by accidental and volitional mental states, we must admit that diseased conditions in these organs must be influenced by similar accidental and volitional mental states; and any state that can be produced accidentally can be produced volitionally. In short, then, if you can influence the blood supply to the lung by the means of volitional energy, can you not modify the course of disease in the lung by the same procedure? And such disease would be yet more influenced by the modification of the secretions of the mucous membranes and of the glands. Volitional control of the heart's rhythm and force would also certainly bear upon the conditions attendant upon organic cardiac disease.

Any patient and observant investigator can quickly satisfy himself in his clinical work, of the truth of the statements of the psychologists, that action and secretion in the tissues and organs are modified by mental states. Experimentally, these facts are most easily demonstrated by developing the desired states of mental control through direct suggestion, while the subject is in a condition of passive sympathetic attention. Clinically, there are many directly and indirectly produced conditions in which mental control over tissue activity is shown. Indeed, no one who has carefully looked into the subject will deny that the physiological activities in the body are constantly being stimulated or inhibited by the co-existing mental state.

Theoretically, we may argue for abstract parallelism, but clinically we all recognize that the modification of physical phenomena is generally the direct result of a change in mental attitude produced by conditions in the environment of the patient.

As I understand medical psychology, it is based upon this theory, that the tissue activities of the organism are

constantly either being stimulated towards an increase of the energy of recuperation and repair, or this energy is being inhibited by one's mental attitude. And that while mental attitude is, generally speaking, automatic and habitual in its action, this attitude can be modified through volitional attention, and in this way new habits can be acquired.

The influence of the physician upon the mental attitude of his patient is, of necessity, important. Our neglect of this has hitherto been due to the fact that we did not grasp the reality of this influence. That the mind of anyone is being constantly influenced by its environment is only beginning to be comprehended, and the importance of the bearing of this fact upon the practice of medicine can hardly be exaggerated.

The indefinite use of the term "suggestion" produces much confusion of thought, and especially so, as it is often used to convey an idea of some mysterious force. I understand the fact to be that everyone is constantly giving and receiving suggestions, and that no suggestion is without some influence upon the receiver. The physician's suggestions usually reach a sympathetic and responsive mind, and are, therefore, especially productive of result.

Briefly then (1) psychology teaches us that the mind of the subject directly influences the tissue activity of his entire organism, and (2) that the mind is being constantly influenced by its environment, and, especially, by the ideas presented to it by those with whom it is in active sympathy.

Practically, we find much variation in the responsiveness of different tissues to the mental attitude, but among the more active are the circulatory and secretory systems.

Acting upon these ideas, I find myself appealing in every case directly to the intelligence of my patient, and when I find, as I usually do, a sympathetic and interested response, I invariably see some beneficial result from my efforts.

I try to impress such ideas as those already expressed; that a constant energy is diffused from the higher controlling centres which is modifying the activities of all the cells; that this efferent energy is directly influenced by the mental attitude; that this mental attitude is to the greatest extent the result of volitionally acquired habits of thought, and that the presence of the idea in consciousness is not the essential element, but that the nature of the dominating idea in the controlling and impelling complex is the important factor. Hence, in general, I try to produce a confident expectant attention, with an entire suppression of the anticipation of failure, and the constant presence of a subjective sense of physical control.

I well know how wildly absurd this sounds to those who have not, or will not, investigate it, but a few of you know that it is more than a theory; and I urge those of you to whom it appeals, to apply it, and if you will exercise a patient expectant perseverance, you will be surprised—yes, often astounded—at the results. Do not give up that which you know to be good and beneficial to your patients, but add this something to what you are now doing, and you will, at once, increase the efficacy of all your work. The satisfaction you will attain will more than compensate you for your efforts.

My assertion, that after thirty-five years of constant medical practice, I find the entire atmosphere of my work greatly changed for the better, and the results of my treatment immeasurably improved through the application of these ideas will, I know, carry more weight than the recital of any number of cases. Yet you will get some help from a few briefly sketched examples of the results obtained in actual practice in respiratory and circulatory disorders.

I need not mention cases of functional circulatory disorders, such as many forms of tachycardia, and purely

emotional disturbances of every class. In these, all admit the direct and all-powerful efficacy of mental influence.

In organic heart lesions, however, few realize what can be done. Here the attitude of constant fear and the anticipation of disaster give place to a state of physical comfort and confidence in the ability to control the organ.

Thus, in the case of a young man, E. M., to whom I was called last June (1911). He was 22 years of age, and had been seriously ill for some weeks, suffering from an acute exacerbation of a chronic endocarditis, accompanying an acute rheumatism. His heart had been much impaired for many years from previous attacks. It was greatly dilated, and this condition was accompanied by the usual distressing symptoms in an aggravated form.

A change in mental attitude was quickly followed by physical improvement in all the conditions. In a few weeks he voluntarily stated that while my remedies helped him much, my visits and talks helped him more. He soon resumed and has continued his work. I met him in the street during the past few weeks, after not having seen him for many months. He said in substance: "I am steadily at work, my heart generally behaves well, and when I feel that I am over-straining it, I stop and talk to it. I feel that I can control it entirely, and I know that I do."

In January, 1911, A. H., a boy 9 years old, came under my care. Previously healthy, he was now suffering from a most severe rheumatic endocarditis. A mitral systolic murmur was the loudest and harshest I have ever heard. Dilatation was great, and his symptoms assumed a severe septic type. One of my confrères (a member of this society) gave an emphatically bad prognosis. The patient combatted the administration of all medicine, but responded mentally very readily. His improvement was slow, but after it once began, satisfactory, although the valves were

left terribly deficient. He spent last summer at Manchester-by-the-Sea, and the past winter at home, attending school. He is now the picture of health, and came to me in May for permission to take part in the school athletic sports, saying he could win several prizes. A loud murmur still persists.

I am well aware that this description of the results in these cases gives little idea of the reality. I can, however, emphatically state that I have never known a purely medicinal treatment approximate them, nor those in several other cases of both acute and chronic organic lesions, where the mental attitude was stimulated to active co-operation.

I shall give one other case to show the extraordinary degree to which direct heart control can be developed :—

In 1907, for peculiar social and non-financial reasons, I was called upon to take charge of Mrs. C., 22 years of age. The heart had been diseased from early childhood, there being a severe mitral insufficiency. It was very weak, and she was generally frail and nervous, with the necessary accompanying cardiac instability. She had had two children. Both labours, it was stated, ending in a complete collapse and severe hæmorrhages. She was recovering from a recent operation, in which she had collapsed under the anæsthetic, and had been told that she should never again risk taking any anæsthetic under any circumstances. She responded to suggestive treatment, phenomenally, and soon, apparently, completely controlled her heart.

She became pregnant for the third time, but bore its strain wonderfully well. I kept the suggestion constantly before her that she should have an easy labour, and that her pulse would remain throughout it all at 80. As the crisis approached, her family became more and more apprehensive of disaster, and one sister came many hundreds of miles so as to be present. Her courage and self-control were superb. The labour was too rapid for medical assistance to be present,

and the pulse was 80, when, during the third stage, I arrived, and did not vary from this rate. She immediately fell into the quiet sleep of a child, and every condition was ideally normal; the pulse remaining for days always just about 80.

My experience in asthma is not every extensive. With several cases I have found the paroxysm in pure asthma almost uniformly relieved by suggestion, but in older persons with a deeply fixed habit, their recurrence has often not been controlled. In younger people, it appears to be more favourable.

One very chronic complicated case will illustrate the results obtained in several others:—

F. H., aged 40, had had asthma since infancy. During each winter, for many years, I had attended him for a very severe, chronic bronchitis, with at least one attack during the season, of some bronchopneumonia.

During the fall of 1907, he was worse than usual. He would brace himself for most of the night, cough incessantly, and the purulent expectoration was most profuse. His weight fell to below 118 lbs.

I had used direct suggestion with his family, and his wife had begged me to do so with him, but not realizing that it could benefit him, I had postponed doing so. On Sunday, December 29, 1907, he was too ill to get up. Upon my arrival he requested me to talk to him. I did so, and the result was marked. He was taking much medicine, but he gradually, upon his own volition, stopped entirely. He immediately began resting better, and every symptom rapidly disappeared. He resumed his work on January 2, and before the middle of the month his cough and expectoration had entirely ceased. On February 1, he weighed 132 lbs., a gain of over 14 lbs. in a month, and he continued better than he had been for many years. During the succeeding

years, so long as he remained under my observation, he had no real return of the asthma or the bronchitis.

The spasmodic night cough and profuse expectoration of chronic bronchitis can often be promptly and permanently relieved.

I have had quite a series of severe cases of irritability of the respiratory tract and entire mucous membranes which come into the group commonly called "hay fever," in which the results were simply astonishing to me, and the failures very few. The relief from the asthma, the profuse secretion, and the burning sensation in the mucous membranes is often apparently immediate and generally permanent.

I am led to believe that the whole course of pulmonary tuberculosis can be modified by proper mental adjustment.

It is necessarily hard to prove that the secretion of the antibodies can be stimulated by purposive attention, and the subject is too extensive for me to discuss in my limited time.

It is open to question if the results obtained by our most successful men are not more often due to indirectly suggested mental control than to the direct physico-chemical action of the applied remedies.

That through the mental attitude, the circulation, the digestion, and all secretions and excretions can be modified is beyond question; and I have too frequently seen the temperature influenced to have any remaining doubt that in many conditions it is subject to mental control.

And when so many of the symptoms can be directly affected, the entire syndrome must, necessarily, be modified. I am certain that I have seen the course of the disease modified in every stage, and in very many different combinations of pathological lesions.

I shall sketch one case as an illustration of several:—

In November, 1906, E. R., 22 years old, just arrived from the Pacific coast, was placed under my care. His

condition was such, that had he been equal to the journey, I should have advised his immediate return. One lung was entirely infiltrated, and the other apex involved, while a general congestion impaired the entire tract. The heart was rapid and weak, and the temperature remained high. He attempted to take but little food, and this caused him acute distress, while he asserted that to take any medical preparation caused great agony. His bowels moved only when forced to do so.

The tarsal bones of one foot seemed all disorganized, and soon after he came, they seemed to loosely crepitate in a suspending purulent emulsion. His restlessness and anxiety were extreme.

Absolute rest in Heartsease Hospital, beginning upon a milk diet, was my only possible course. He responded wonderfully to direct suggestion. The extreme restless anxiety and nervous irritability gave place immediately to a peaceful optimism. In a few days he was upon the fullest forced diet, without digestive distress, and his bowels were moving regularly. Every symptom, except those due to the foot, rapidly improved, so that in a month his temperature and pulse were normal, and in nine weeks he left the hospital wearing a plaster cast which was made removable, as two sinuses were discharging in the foot.

In February, 1907, amputation seemed unavoidable, but rapid improvement began and continued. His general condition became so good that he went into the mountains near by for the summer; the foot slowly but continuously healing. As his lung improved, its contraction rendered breathing difficult. In the summer of 1908, he discarded his crutches and walked with a cane. The winter of 1908-1909 he spent in Arizona, returning in the summer, but he has been in California continually for the past two years. He writes that he has just had a severe illness, and is now

taking some special serum treatment, but that he has not lost his helpful optimistic state of mind.

I consider the usual, so-called "optimism" of the tubercular to be more often the indifference of hopeless despair than the confident hopeful expectancy of a conscious self-control.

Other cases would but repeat this general outline, but yet would give little idea of the phenomena really observed. I have seen confirmed night sweats stop with one suggestive treatment, and almost every other characteristic symptom as promptly influenced.

I cannot better conclude this superficial sketch than by the bold assertion that, after several years of close study, and practical investigation of this subject, I am firmly convinced that in the volitional development of the subjective mental energy of the patient—that energy which has always been the active agent in repair—there is a therapeutic potentiality which is far greater than we can with our present knowledge, realize.

A STUDY OF PRIMARY CANCER AND SARCOMA OF THE LUNG.

By ROLAND G. CURTIN, M.D.

PHILADELPHIA, PA.

I HAVE a two-fold object in bringing before you the subject of primary malignant disease of the lung. In the first place, it has never been considered by the Association, and in the second place, I can perhaps give you some aids in its diagnosis. Judging from my own experience I think that primary malignant disease of the lungs is more frequently overlooked than any other serious pulmonary condition. It is an exceedingly rare disease, not usually diagnosticated in the early stage, and later it is often obscured by the metastases that usually occur. Its rarity is shown by the statistics which will be given you further on. When it occurs after an operation, especially amputation of the breast, it is early suspected, but without such a history it is often wrongly diagnosticated as one of the more common diseases of the chest; it is more frequently mistaken for pleurisy with effusion, hydrothorax, empyema or acute miliary tuberculosis. After tapping the chest, the usual surprise is the small amount of fluid obtained and the slight, if any, relief to the dyspnœa. As a metastatic disease it is not infrequent, as indicated by *post-mortem* evidence. The rarity of primary cancer of the lung is shown by statistics of Dr. John A. McGlinn, of Philadelphia, who recently collected the data from the *post-mortem* rooms of the Philadelphia General Hospital. In 8,515 consecutive *post-mortems* he found 457 cancerous bodies, and of these only four were primary cancer of the lung. I inquired of a physician with

good diagnostic ability, who had a large private and consulting practice and was the holder of several important hospital positions, as to how many cases he had met with? He told me he had met with only three in his long experience.

Dr. McGlinn, in his report of 457 cancer cases, found metastatic disease in the lungs and chest as follows: Aortic glands, 1; bronchial lymph nodes, 1; lungs, 70; mediastrial lymph nodes, 4; mediastinum, 25; pleura, 30; trachea, 1; thorax, 3; thoracic duct, 1; in all making 191 cases in 457 cancerous cadavers, where the chest was secondarily affected, the lungs being most frequently attacked about one in six and one-half cases.

The report of the four cases of primary cancer of the lung in the Philadelphia General Hospital, found by Dr. McGlinn, is as follows:—

Case 1.—White, female, aged 65, cancer of the lung, complicated with syphilitic disease of the liver, of the uterus, and chronic adhesive pleurisy.

Case 2.—Black, female, aged 34, cancer of the lung, complicated with fibroid of the uterus and adhesive pleurisy.

Case 3.—White, male, aged 30, cancer of the right lung with metastases in the bronchial and mediastinal lymph glands, liver and left lung.

Case 4.—Black, female, aged 40, cancer of both lungs, miliary tubercle of both lungs, cavity in right lung.

Dr. Williams, of London, gives the statistics of 13,824 malignant tumours and found only seventeen cases of primary cancer of the lungs or one in 814 cases, while Dr. McGlinn's results show one in 137 cases of cancer. I have met with seven recognized cases of primary malignant disease of the lungs in forty-five years of practice, two of which were in my private practice, three in hospitals, and two in consultation. When we compare the frequency of pulmonary tubercle with that of pulmonary cancer we see a wide difference. Dr. Williams writes on this subject that "over

80 per cent. of all malignant tumours arose in locations where tubercles were seldom met with. On the other hand, the lung, whence such an immense number of cases of primary tubercle arose, very seldom originates any form of malignant disease." He also says "considering the great frequency of both maladies, the comparative rarity of their co-existence is remarkable; and a certain antagonism is thus indicated which, however, falls short of absolute incompatibility." If the cause of cancer was atmospheric we would naturally expect that the lungs would be more frequently affected.

Statistics of my seven cases of primary cancer and sarcoma of the lung are as follows: Males, 4; females, 2; and 1 male with sarcoma* of the lung. With effusion four, and without, three. On the right side, six, and on the left, one. Four cases were tapped, and three were not. Tapping did not relieve two, and two were only slightly relieved, and only temporarily. There was marked dyspnœa in six of the seven cases. The average age of the cases was 52 years. The average age of Dr. McGlinn's cases was 42. Dr. Musser's three cases averaged 55, and Ostrom had seven cases between 47 and 69, and Cinffini's cases averaged 42; of fourteen cases the age of his youngest was 30 years, and the oldest 71. Collectively they may be tabulated as follows:—

30 to 35	2
35 to 40	1
40 to 45	4
45 to 50	3
55 to 60	2
65	1
71	1

* In this case the tumour from the lung ultimately protruded through the chest wall.

This table seems to show that pulmonary malignant disease occurs most frequently between the ages of fifty and sixty.

Complications.—The most common complications of pulmonary malignant disease are metastases in the surrounding tissue, most commonly the pleura, which is perhaps always affected. The pleura may be thickened or it may be full of sacculations or pockets, filled with clear or bloody serum. I have never seen the fluid free to move in the pleural cavity.

Symptoms.—Loss of flesh. The first symptom is often gradual loss of flesh without explainable cause continuing generally to the end. This may begin two or three months or even six months before local manifestations appear. This is more likely to be present in carcinoma than in sarcoma.

Pain may be slight at first or it may be very severe. It is generally in the side affected and gradually increases in severity. Sometimes it is fleeting. If situated in the right side the pain may be over the liver, or may be in the right shoulder.

Dyspnœa may be very early and often more marked than warranted when compared with the apparent involvement in the chest. The dyspnœa is more like that in gummatous disease of the lung, being more marked than seems justified by the physical signs. We may have occasionally great dyspnœa without any lung or pleural disease from cancerous disease of the bronchial glands, which become enlarged and pressing on the main bronchus so as to prevent the entrance of air into the chest; when this occurs in cancer of the lung, it may explain the great dyspnœa in some cases. The breath generally grows shorter and shorter as the disease advances.

Nervous symptoms usually present themselves later, the

patient growing weaker and more nervous as the disease progresses.

Cough often appears to be the first local symptom. It may be short, dry and unproductive; or it may be accompanied by a little transparent mucus; but later the expectoration may be stained with bright-red blood; and lastly, and rarely, mucopurulent. There is sometimes a blood spitting that is so characteristic that I think a diagnosis may be made from it alone. This pathognomonic hæmoptysis is a dark purple or red globule of blood encased in a transparent glazed coating or capsule about the size of the end of the little finger. It is sometimes lobulated or may be rounded in form. The colour is purplish red, like grape juice or dark currant jelly. The surrounding fluid is clear and unmixed with blood. This globule is usually raised with a single cough. I have noticed it in two cases of primary pulmonary disease and several times in pulmonary metastases. It occurs, I believe, only in this disease, so if you have a case with pulmonary or pleural symptoms and the appearance of this expectoration, you can, I think, at once make a diagnosis of malignant disease of the lung. I have never noticed the same expectoration of blood in any other disease and it is generally, when present early in the disease, only preceded by emaciation and slight dyspnœa. As I have seen it, the pleural effusion of pulmonary cancer is peculiar; it is very irregular. The serum is contained in cysts or rather sacculations, that may be large or small, usually one-half to eight or ten ounces. This condition may explain, at least in some cases, the little relief experienced after tapping, for all the fluid is never removed. The fluid is almost always tinged with blood, but sometimes it is clear serum, and at times the blood is so pure as to coagulate when removed. The physical signs are those of a solidified lung, or those

of pleurisy with effusion or both. Late in the disease we may have a bulging of the side from effusion, or by a tumorous lung, but this occurs, if at all, near the end. Late in the disease, the diagnosis is generally more easily made. By keeping in mind the emaciation without apparent cause, the marked dyspnœa, the inability to successfully draw the fluid from the pleural cavity, a diagnosis may be almost certainly made, but with the expectoration of the blood in globule form there can be no doubt that we have pulmonary malignant disease. In one case I noticed marked varicose veins at the base of the right chest and upper abdomen. I have also noticed in one case varicose veins at the side of the trachea, at the base of the neck on the side affected. In two cases I noticed unilateral sweating on the opposite side of the trunk. A diagnosis is generally easy when the disease occurs secondary to an operation, especially the amputation of a breast or when the disease is present in other organs.

Conclusion.—First, we have the early emaciation in true carcinoma before any local symptoms. Second, we have marked dyspnœa. Third, the scant relief obtained by tapping. Fourth, the expectoration of the globule of blood heretofore described.

DISCUSSION.

Dr. J. N. HALL (Denver, Colo.) referred to a phenomenon that he had noticed when attempting to make a diagnosis by means of puncture, the development of nodules at the site of the puncture. He reported the case of a Chinaman with cancer of the lung and accompanying pleurisy, who was tapped several times and much fluid evacuated each time. He always had bloody expectoration. At the point of puncture these nodules developed. He asked if this was at all common in the experience of others.

Dr. J. H. ELLIOTT (Toronto, Can.) said that a striking feature in cases of primary carcinoma of the lungs was that the expectoration

was usually mucoid and not purulent. The "currant jelly" expectoration did not always appear, but when present was significant, and it was usually in mucoid sputum; very different from the purulent sputum of phthisis.

Many cases that were regarded as primary malignant disease were not primary at all, and this fact was overlooked because of incomplete autopsies. He recalled at least two cases that were looked upon as primary disease, but careful investigation revealed small growths elsewhere. In one case it was in the prostate, and in the other there was a small growth in the femur.

Two years ago he reported a case of primary growth of the left bronchus. The man gradually died with marked secondaries through the liver and other abdominal organs. He had hæmoptysis many months before he sought assistance. He was a strong, vigorous man, a captain of a steamship on the Great Lakes. The hæmoptysis was the prominent symptom in this instance until cachexia set in.

Dr. MORRIS MANGES (New York) said he had seen two cases of new growth of the lung diagnosed by hardening the sputum and cutting the same as one would cut sections. The presence of small thoracic glands in the fourth and fifth spaces was not infrequently met with. In three cases he recalled, the diagnosis of new growth was confirmed; in two other cases carcinomatous nodules were not found, but small glands were noted.

With regard to the question of aspiration in these cases, the amount of fluid removed was usually large and bloody. Cytology could not be used because of the blood mucus. The failure to relieve after aspiration was very often due to an enlarged bronchial gland which, by its pressure, caused dyspnœa.

Dr. VINCENT Y. BOWDITCH reported a case of a woman at the Sharon Sanatorium who died there of cancer of the lung and pleura, the disease having earlier been mistaken for one of incipient tuberculosis, because of the history of fever to a moderate degree, cough with occasional bloody expectoration, and with physical signs showing dulness with modified respiration at the apex of the right lung.

A slowly increasing asthmatic tendency with great nervousness had complicated the symptoms, but no change in diagnosis was made until upon a sudden and very violent attack of dyspnœa evidences were found of a large effusion in the right pleural cavity, sudden in onset. Thoracentesis disclosed about one quart of dark bloody-coloured fluid, which made a suspicion of malignant disease The operation temporarily relieved the excessive dyspnœa, and the patient partook of a hearty supper, soon after which she fell backwards and died instantly. An autopsy showed extensive malignant disease of the pleura and top of the right lung, and no evidence whatever of tuberculosis. As to the cause of the sudden death, no satisfactory explanation could be given. The brain, however, was not examined, and Dr. Bowditch recalled a similar case, with sudden death, in which an

embolus of one of the cerebral arteries was found, evidently the cause of the sudden fatal ending of the case.

Dr. J. H. PRATT (Boston, Mass.): I can confirm Dr. Bowditch's statement. No suspicion of cancer entered my mind at the time I examined the patient. The history and the physical signs presented a clinical picture not infrequently seen in pulmonary tuberculosis. The diagnosis seemed clear, and I urged the patient to enter a sanatorium without delay. I saw her on February 26, 1912. This was a week or more before she came under Dr. Bowditch's observation. She complained of cough and inability to work. A coryza in October or November had been followed by a persistent cough, especially troublesome in the morning. At times she had had afternoon fever. During January she raised blood-stained sputum, pink in colour, every morning. She had never previously spat up blood. There was a history of night sweats and of pleuritic pain. At the time of my examination her weight was 130 pounds, which was a gain of 3 pounds since Christmas. Her temperature was 99.4, pulse 96. There was a marked dulness at the top of the right lung with tubular breathing and bronchophony; no râles were heard.

Dr. WALTER ALDEN GRIFFIN (Sharon, Mass.) said that the patient showed signs of a beginning tuberculosis—nobody could have said at first that the case was not tuberculosis. There was slight dulness at the top of the right lung with roughened breathing and fine râles. There was hæmoptysis on several occasions, the blood expectorated being very dark. Because of the frequent occurrence of the blood, no examination of the chest was made for two or three weeks, but finally, when made, there was found to be evidence of pleuritic effusion. The fluid withdrawn was, as Dr. Bowditch says, very decidedly bloody.

Dr. VINCENT Y. BOWDITCH (Boston, Mass.) said that someone had told him of a case. At autopsy the brain was examined and there was found a hæmorrhage which was the cause of the sudden death of the patient.

Dr. EDWARD R. BALDWIN (Saranac Lake, N.Y.) reported a case of sarcoma of the pleura which was diagnosed as tuberculosis, and the patient on that diagnosis was sent to him; this patient had all the cardinal symptoms of tuberculosis. The physician who sent him had a carefully prepared radiograph taken, but there had been no examination of the blood made. The polymorphonuclear leucocytosis could not be accounted for by the presence of any tuberculosis, but phthisis was suspected. The autopsy made some months later showed sarcoma of the pleura, which extended through into the mediastinum and which finally involved the abdomen and peritoneum.

Dr. A. JACOBI (New York) said that his experience with these cases was not so large as that of others present. He had, however, seen a few cases of primary carcinoma of the lung. He had seen cases of mediastinal adenomata; in one case the growth was very large and the glands were enlarged about the fourth and fifth ribs.

It was his impression that a large number of these cases of carcinoma of the lungs were secondary, and that the primary cases were very rare.

Dr. Jacobi wished particularly to draw attention to Dr. Isaac Adler's book that had lately appeared, and which dealt with this subject. It was very extensive, so extensive he had not yet read all of it, but a book which he considered to be of great value. It contained from 300 to 400 pages and tabled cases that had been collected from all literatures. He thought that possibly many of them had not seen it, and it appeared to him that the book would be of value. The author had worked over the subject for eight or ten years or more, and proven cases in the literature had not escaped his attention. He found there a collection of several hundred cases that were tabulated. He believed it worth while of those who were interested in the subject to look it up.

So far as tuberculosis was concerned, when younger, Dr. Jacobi learned from the writings of Rokitansky, that the latter did not believe that cancer and tuberculosis were to be found associated. One seemed to exclude the other. That was a mistake of his. Since then, a number of cases had been described where tuberculosis and carcinoma were found in the same chest. The history and nosology of that subject have also been treated in a special chapter of Adler's book.

So far as the treatment of these cases went, Dr. Jacobi believed that the modern surgery of the chest, which had been developed so much during the last few years, would be of some service, provided the diagnosis was made early enough. Certain men were now operating upon intrathoracic tumours with moderate success. These men expect to have greater success. In such cases, the methods employed in intrathoracic surgery as those of Robinson, of Boston, Willy Meyer, of New York, and other surgeons, men who are able to cut out certain parts of the lung, promise a great amount of success in the surgery of these cases, if the diagnosis be made early enough. The lungs were not accessible to the surgeon.

Dr. Roland G. Curtin (Philadelphia, Pa.), in reply to Dr. Hall's question, said he had never seen a case where nodules followed the point of puncture of the chest. What had been reported by Dr. Hall seemed to him to be more like sarcoma than carcinoma. If pus was present, it must have been late in the disease, so far as his experience went. He had never found it.

He had participated in four *post-mortems*, and in all of them, the secretions, blood, and serum, were encapsuled. He had never seen a case where the pleural cavity was occupied by free or unencysted fluid.

REPORT OF TWO CASES OF RECURRENT LARYNGEAL NERVE PARALYSIS COMPLICATING MITRAL STENOSIS.

By JOHN D. THOMAS, M.D.

WASHINGTON, D.C.

The title, as given, is merely to follow in line with others who have reported cases, but really does not state some of their most interesting features. Before giving the case reports I wish to call your attention to certain conditions which will be mentioned and which have seemed to me to be of very great interest.

(1) The evident insufficiency of the pulmonary orifice.

(2) The seeming temporary improvement of symptoms, particularly in one case, as this insufficiency developed.

(3) The absolute absence of any signs of the only lesion with which it could be confused; namely, aortic insufficiency.

(4) The systolic pulsation in the second left interspace.

These points will be discussed more fully later on. (Case Reports.)

A most complete *résumé* of this condition was published last year in the *American Journal of the Medical Sciences* by Fetterolf and George W. Norris. They not only reviewed all the cases reported to that date, but showed from their anatomical studies the possibilities as to the causation of the pressure on the recurrent nerve. Many of those reporting cases, even with autopsies, had a more or

less incorrect idea of the pathological anatomy which brought about the pressure paralysis of the nerve as it curved around the arch of the aorta. And Fetterolf and Norris attributed some of this to the relative difference in position of the mediastinal organs at autopsy *when* the thorax was opened and *before* it was opened. They claimed that if the body was hardened by injections before autopsy (and in a later article they reported the use of frozen bodies) the relative position of the aorta, the pulmonary arteries and the heart would be nearer what it was during life; and from these studies they drew the following conclusions:—

"Summary.—There are now on record eleven autopsied and twenty-six clinically reported cases in which recurrent laryngeal paralysis was associated with, and apparently the result of, mitral stenosis. Among the autopsied cases the vocal paralysis was attributed to direct compression on the part of the auricle or its appendix in seven; to cardiac displacement, traction, &c., in one; to the effects of a persistently patulous ductus arteriosus in two; and to indirect compression acting on the pulmonary artery in two.

"Conclusions.—It is our conviction, based on careful study of the anatomical relations in hardened preparations, that the indirect mechanism may be a variable one, but that when compression is accountable for the recurrent paralysis, it must always be caused by the nerve being squeezed between the left pulmonary artery and the aorta, or the aortic ligament.

"Anything which will dilate or force upward the left auricle, the left upper pulmonary vein, or the left pulmonary artery would tend to cause the condition.

"The anatomic relations are such that direct pressure of any portion of a dilated left auricle upon the aortic arch is impossible.

"When we consider the softness of all the structures involved, and the fact that the nerve is normally flattened against the aorta, not rounded, it would seem probable that its function is abolished, not from actual destruction from pressure, but from a neuritis consequent upon a degree of compression which could hardly be sufficient to actually destroy the vitality of the nerve. This, of course, can be determined only by microscopic examination of the nerve."

From these conclusions, then, cases of recurrent nerve paralysis should be considered and classed not necessarily as following or complicating mitral stenosis alone (though this is the lesion most often causing it), but should include any of the cardiac lesions which bring about the same pathological anatomical condition, excluding, of course, the diseases of the vessels, as aneurisms. And in this connection a most interesting case was reported by G. A. Gibson in May, 1905, in *The Practitioner,* London, p. 600, with a clinical diagnosis of chronic interstitial myocarditis with cardiac failure from arterial changes. Left vocal cord paralysis from large heart pressing the conus arteriosus and pulmonary artery upwards against the arch of the aorta, and thus implicating the recurrent nerve. Under proper treatment the patient improved rapidly, the voice returned, heart failure symptoms disappeared, leaving only the aortic murmurs of the arterial conditions, and the left vocal cord moved as freely as the right. This case is of particular interest because of the disappearance of all recurrent nerve paralysis symptoms, *pari passu* with the heart's regaining compensation. Sheldon's case and Alexander's and Tretrop and Boinet's show the same appearance or disappearance of the vocal cord symptoms, as the patient became worse or better.

Some of Quadrone's cases are reported with changing voice. But all of his cases are certainly not well enough

substantiated to be considered in the list. Both of my cases showed variations in voice at different times; but at no time did I find the *disappearance* of the paralysis of the left cord.

Some other conditions directly connected with the heart which have caused paralysis of the left recurrent nerve are found in the literature.

Bruen, in discussing a paper by Cohen in *Trans. College of Physicians of Philadelphia,* 1886, reports a case which at autopsy was found to be caused by aneurism of the pulmonary artery together with marked dilation of the aorta. Some cases have been reported as caused by peri-pleuritic adhesions.*

If Fetterolf and Norris are right in the conclusions they draw from their anatomical studies, it seems reasonable to suppose that we would find some cases of paralysis of this nerve in the cardiac conditions which bring about great dilation of the pulmonary artery and the right heart.

It is interesting to note that Quadrone reports an autopsy on one of his cases, No. 2, which showed mitral stenosis, dilation of left auricle which anteriorly came directly in contact with thoracic wall for several centimetres.

If this latter observation is correct, it is directly contrary to what Fetterolf and Norris maintain.

Besides the case of Gibson referred to, I have found two other cases reported by A. Elfer.†

Case 1.—Female, 36, compensated mitral stenosis with paralysis of left recurrent nerve. X-ray showed on the left, between second and third rib, a shadow with blurred margin extending from left of the aorta downward, crescent shaped. The cause of this could not be ascertained. It did not come from the heart, and was not a dilated auricle. There was no autopsy.

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* See *Hirshfelder Pacific Med. and Surg. Journ.*, vol xxx, 1887.

† *Ungar. Med. Presse*, Budapest, 1904, ix, 615.

Case 2.—Female, 33, hoarse seven months, complaining of heart symptoms and general symptoms of heart failure. Insufficiency and stenosis of mitral valves. Left vocal cord paralysis. X-ray showed no formation which could have caused the left recurrent nerve paralysis. No infective disease, &c., prior as a possible cause of the paralysis. No autopsy.

It is maintained by many authorities reporting these cases that unless they are verified by autopsy it is very probable that they may not be due to the mitral lesion. But if the cases are considered in the light of being caused by the general cardiac condition—which I have spoken of before—it seems to me that the careful clinical examination of the case will, in the majority of instances, lead to a proper diagnosis, and certainly from the reports already to be found of these cases those with the more detailed clinical histories and examinations can be diagnosed properly.

As I mentioned in the beginning of the paper, I wish to call attention to a condition which was present in both of my cases, and, from a study of the cases so far reported, I think was evidently present in several of those. I refer to insufficiency of the pulmonary orifice. In the majority of cases this insufficiency is what may be called relative, just as occurs at the tricuspid orifice in loss of compensation of the heart. And this condition is a safety valve action, just in the same way as we often see in the relative tricuspid insufficiency. In one of my cases the very evident alleviation of symptoms could be noticed as the pulmonary valve lesion became more and more marked, until at the present time, when the pulmonary lesion is the predominant note upon auscultation, the patient is in comparative ease. This condition of insufficiency at the pulmonary orifice I have seen in two other cases of mitral stenosis; in both of which this same temporary alleviation of symptoms, dyspnœa, &c., has occurred.

This is a more common lesion than is supposed, and I think if we were on the look-out for it we should find it oftener, particularly in the terminal stages of mitral stenosis as well as sometimes of insufficiency.

The lesion with which this condition is most often confounded is aortic insufficiency, but with a careful examination of the arterial system and the other cardinal signs of aortic insufficiency this lesion can be eliminated.

Koellreutter's, Gavello's, and Dmitrenko's cases all showed some of these signs of this condition; particularly Dmitrenko's case, in which he secured a tracing of the dilated pulmonary artery pulsating at the second left interspace. Pulsation at the second left interspace is very often seen in mitral stenosis, but you can hardly say that all of these cases are caused by a dilated pulmonary artery. Certainly in some of these cases there is no diastolic murmur or other evidence of an insufficiency of the pulmonary orifice.

From a study of my cases, it is rather hard to definitely classify them as to whether they are cases of uncomplicated mitral stenosis, or whether they may not have some congenital defect or lesion of the heart or arteries. Some of the cases which have come to autopsy have shown certain congenital defects which were not recognized clinically, and yet others in which the congenital defect was diagnosed before death.

Case 1 has evidently had the cardiac condition since early childhood from the history given. It has evidently been progressive within the last five or six years, and has now reached a point where we cannot hope for any very great prolongation of life. And it seems that if this condition had been a congenital lesion, as, for instance, a patent ductus arteriosus, the symptoms would have been much more marked during the early stages. On the other

hand, the presence of certain evident congenital lesions, as, for instance, the loss of vision in one eye, and the trouble with the right eye-lid, seem to show a general tendency to congenital deformity. It is quite certain that the case when first seen presented symptoms of pure mitral stenosis, and the symptoms and signs of the pulmonary insufficiency have developed since.

In Case 2 there seems to be much more reason for believing that it is a congenital lesion. The history shows that the patient has been cyanosed from birth, or at least early infancy, although no other signs of congenital defect could be found.

Case 1.—Miss X, aged 19, white, clerk; seen first May 11, 1909. She was referred to me by a laryngologist, to whom she had gone for her throat trouble.

Family History.—Father had some nervous trouble, with inco-ordination of speech.

The patient was told when a child that she had some heart trouble, and had to stop school at 8 years of age on account of her eyes. An oculist told her eleven years ago she had been blind in her left eye since birth. She had typhoid fever at seven. She has had laryngeal trouble for some months. Dr. C. W. Richardson told her a short while ago that she had left vocal cord paralysis. She is of nervous disposition; frail, and not well nourished. She gets out of breath easily on slight exertion. The right upper lid is arched upward about middle, showing more of the ball than left eye. The left vocal cord is paralysed and stationary. She gets quite hoarse; voice has brassy quality.

Examination.—Chest small, but regular in outline.

Lungs.—Dullness quite perceptible at left anterior from clavicle to heart dullness—with some harsh breathing at both upper lobes.

Heart.—Visible forcible pulsation shaking the pericardial region. Apex beat outside nipple line between sixth and seventh ribs.

Palpation.—A forcible beat, and a slight rough feeling with the first and second sound from second and fourth ribs inside left nipple line.

Percussion.—Base of heart out 2½ to 3 in. from left edge of sternum, and from first interspace down to sixth interspace.

Auscultation.—Heavy flip-flap beat above and internal to nipple. A presystolic murmur over third and fourth interspaces—and a systolic and diastolic murmur from first interspace down to third rib along left border of sternum. A few days later the presystolic murmur was still prominent; but the diastolic murmur was not so much so, though the strong flip-flap note over the mitral area was still marked, as well as a more defined presystolic thrill felt over this area.

In a month's time the sign remained about the same, but the blowing murmur following the second sound at the pulmonary valve and transmitted down the edge of the sternum became more distinct. The patient's general condition improved, but the voice was still hoarse.

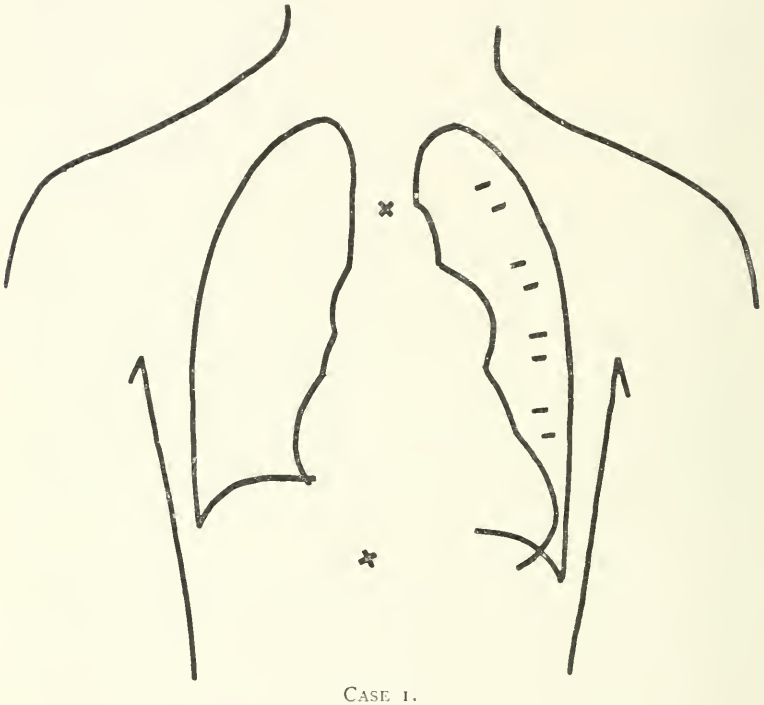
The systolic murmur at the base of the heart became very distinct November 21, 1909. Orthodiagraphic tracing made by Dr. Walter H. Merrill at Garfield Hospital (see diagram, p. 338). It showed the marked enlargement of the base of the heart towards the left, and some enlargement to the right. An X-ray plate was taken at the same time, and showed marked enlargement of left heart at base. And also of the right heart at the right lower part of the sternum. Unfortunately, the plate was damaged, and I could not get a print from it.

The left cord remains immobile, but the right cord seems to reach farther over towards the left, and consequent improvement is seen in the voice, and at the same time improvement in her dyspnœa and general health. Examination of heart at this time, April, 1910, shows a very marked increase in the diastolic murmur heard from the second interspace down the left edge of sternum to the fifth interspace. It is not heard over the aortic valve area, or towards the apex. The heart is enlarged somewhat more upward and to the right.

A short while after this the diastolic murmur at the pulmonary space could be easily increased in intensity by the patient inspiring, then closing the glottis and forcibly trying to expire.

Two months later, October, 1910, the presystolic mur-

mur over the mitral area became less distinct, and the diastolic pulmonary murmur much more distinct. In June, 1911, eight months later, a very *distinct pulsation* was seen in second left interspace. Three months later the presystolic murmur was absent, the whole field being dominated by the loud diastolic murmur at the pulmonary space. This murmur was heard most distinctly over the pulmonary



Case 1.

space, the pulsating area, and was conveyed down the left edge of the sternum.

During this time the compensation of the heart seemed to improve, though exertion of any great amount would cause marked dyspnœa.

April, 1912, Dr. T. S. Lee very kindly made a polygraphic tracing of the apex beat, and also of the pulsating area at the second left interspace. The radial pulses were so small it was impossible to get a tracing from the jugular.

The tracing from the apex, as you will see, is very weak and small, particularly when compared with that from the pulsating area in the second left pulmonary space (p. 341).

The blood-pressure at this time was: Systolic, 110 mm.; diastolic, 75 mm.

The presystolic thrill was felt internal to the nipple; but the presystolic murmur could not be heard, although the snapping first sound was present. The systolic murmur over the pulsating area and transmitted down the left border of sternum was very loud and harsh, and dominated the whole field. This murmur was distinctly increased by deep inspiration, closing the glottis, and then trying forcibly to expire.

There were no arterial sounds or signs indicating aortic insufficiency.

The patient seems much better. Voice clearer, and dyspnœa not so bad; though dyspnœa appears on very slight exertion.

Case 2.—R. B., female, white, aged 14, Arabian. Seen in Emergency Hospital Chest clinic, Washington, D.C., July 21, 1909. History by Dr. Cabell Moore.

Difficult to get full history on account of her foreign language. Family history negative. She has been in this country some years. Always short of breath, and getting worse lately. Pain at times over heart; cough. Skin is yellowish, lips and hands blue. Pulse 72, regular, low tension.

Heart enlarged to right and left; apex in fifth interspace. Thrill at pulmonic space. Accentuated aortic second; and much accentuated pulmonic. Presystolic murmur loudest just above and internal to apex. Distinct flapping first sound.

Laryngologic examination by Dr. Walter A. Wells showed the left vocal cord paralysed. I saw the patient July 24, 1909, but did not make examination then. Dr. Thomas A. Groover made an X-ray of chest, which showed a marked enlargement of upper left heart, and also of the right ventricle. She has been coughing a good deal. Sputum analysis for tubercle bacilli is negative.

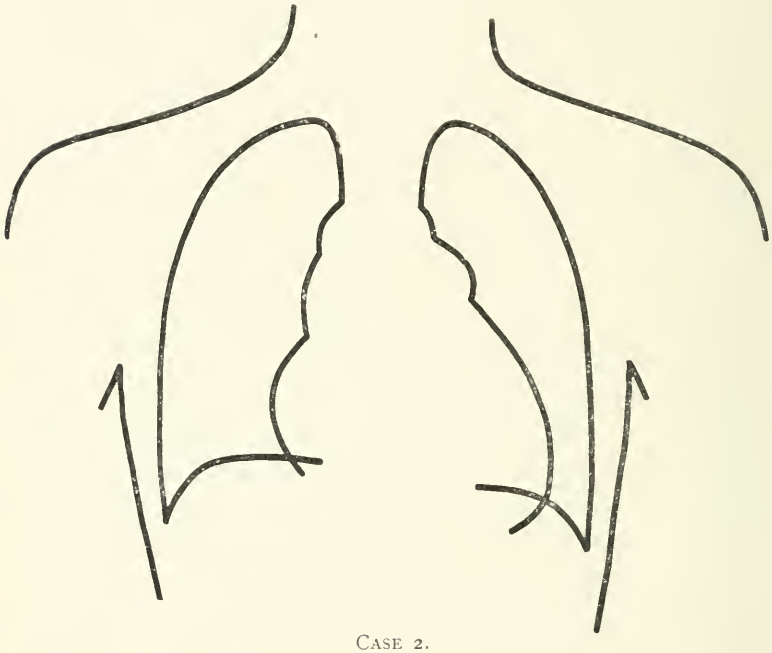
August 21, 1909. Had been too ill to come to clinic before. Cough is now better. Voice changes—can make sounds better sometimes than at others.

Examination by myself at this time showed:—

Inspection.—Pulsation in second left interspace 2 in. from sternum. Also apex beat between fifth and sixth ribs 1 in. to left of nipple line.

Palpation.—Presystolic thrill at apex; and marked impulse and thrill with second beat of heart over the pulsating area mentioned above.

Percussion.—Dulness beginning in first interspace,



Case 2.

one and a half inches from left border of sternum, and extends downwards with slight inclination to left to fifth interspace just between nipple line and anterior axillary line. On right side the dulness extends at the lower part of sternum 1½ in. beyond the right border of sternum, and gradually inclines inwards until at the first interspace the line of the dull area is marked by the right border of the sternum.

Auscultation.—On standing, a slight presystolic mur-

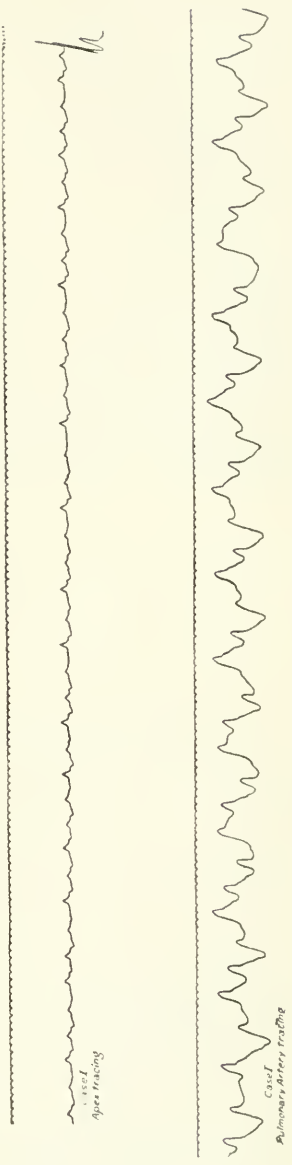
mur is heard from second left interspace to the fourth rib, where it disappears. At the pulmonic valve area is heard a soft blow with the second sound of the heart, and is carried a short distance down the left edge of the sternum. The flapping first sound over the mitral area is quite marked. On lying down the presystolic murmur is quite marked over the mitral area; and a systolic down the left border of the sternum, and also at apex. The flapping first sound at the mitral area is much increased.

Lungs.—Showed left lower lobe full of crackling and squeaking râles; voice sounds diminished over left lower; and some slight dulness over same area.

Laryngoscopic examination by Dr. J. H. Stone, September 22, 1909, showed paralysis of left cord.

Blood-pressure, systolic 105 mm. The thrill with the second sound felt very distinctly at left of sternum from first to third ribs over pulsating area. The presystolic murmur over mitral area very faint to-day in standing position, but distinct in recumbent posture. Right heart quite much enlarged to the right of sternum. Cough is better; voice still hoarse; looks better, and not so cyanotic. Heart evidently performing more satisfactorily; pulse small.

Patient now passed from our care, but I saw her once or twice afterwards, and she was losing ground. On November 21, 1909, an orthodiagraphic tracing was taken for me



by Dr. Walter H. Merrill at Garfield Hospital (see page 340), which showed the same conditions as the X-ray plate; though, if anything, a somewhat larger heart than existed four months before.

February 10, 1910, she was sent into the Georgetown University Hospital, and again came under my care through the courtesy of Dr. S. S. Adams, the attending physician.

At this time she was in a very serious condition. Cardiac compensation was so far gone that general anasarca was present. Ascites marked; both pleural cavities filling up; passive congestions in the lungs. Dyspnœa severe. Liver extends three finger breadths below margin of ribs. Kidneys show marked nephritis.

Heart showed all the signs of a lost compensation—and gallop rhythm was very marked. She died a short while afterwards. It was impossible to obtain an autopsy.

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